

MERRIMACK

**FARMERS'
EXCHANGE, Inc.**

Fourth Edition

Poultry

HANDBOOK

Merrimack

POULTRY PRODUCTION

HANDBOOK

Fourth Edition

By DR. A. E. TEPPER



"23 Stores to Serve You"

Merrimack Farmers' Exchange, Inc.

Concord, New Hampshire

A Few Reasons Why Merrimack Rations Are So Widely Used

1. They are fresh —“Made Today — Fed Tomorrow.”
2. The Merrimack Farmers' Exchange, Inc., “The Farmer's Business,” is owned and controlled by farmers. Its stock is owned largely by New Hampshire farmers.
3. No cheap by-products are used in Merrimack feeds. Merrimack purchases on the regular market every ingredient used.
4. Only the best quality ingredients are used.
5. All rations are nutritionally sound. These feeds are carefully mixed and properly compounded for complete nutrition.
6. They are laboratory tested. A chemical laboratory is maintained where routine chemical analyses prove the adequacy of all rations mixed, thus guaranteeing protection to the feeder.
7. Merrimack feeds are reasonably priced. Very low margins over actual costs are assumed.
8. Service is prompt and efficient. Daily truck routes from each store cover the territory and can be expanded upon call. Bulk feed service is also available.
9. We offer courteous retail store and delivery service. All employees are trained to render the best in customer service.
10. Merrimack branded sacks are double air cleaned and sterilized before filling.
11. All feed is thoroughly batch mixed for the proper time, insuring a complete uniformity of mix.
12. Prompt servicing by qualified personnel is available when farm production problems arise.
13. Open pricing of all feeds is the policy, with the same price available to all users for the same quantities on the same day, either bagged or bulk.
14. Discounts for quantity cash purchases are applicable to all.
15. Our limited credit policy enables lower cost of finished products offered for sale and protects the financial interest of manufacturer and feeder.
16. The Merrimack store is more and more serving as a “one-stop” store where complete farm supplies are obtainable.

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POULTRY PRODUCTION HANDBOOK

Landmarks of the Industry

SCIENTISTS generally agree that the progenitors of the present race of domestic chickens were the wild jungle fowl, of which, probably the species of most importance was *Gallus Bankiva*.

Records indicate that our present day fowl were first domesticated in China more than 4000 years ago. India is often mentioned as the original home of the fowl, from which they were shipped east into China and eventually to the new parts of the world as they were discovered.

It is well accepted that the turkey is the only member of the poultry group to originate in America. This bird was found by the early explorers, transported to Europe, eventually to England, and then re-imported to the United States by early settlers.

The general effects of domestication of these early birds have resulted in greatly improved rate of growth, body size, rate of egg production, and subsequent loss of the natural maternal instinct. These developments have resulted in the continued desire for more economical production, due to the realization that there was true market value in breeding and proper care.

The early history of poultry keeping was largely measured in terms of meat production. The best and heaviest birds were selected for the table, with little domestic breeding being followed for improved value. Eventually, however, more emphasis was placed on selection of birds for improvement in both meat quality and plumage color. Increased attention was paid to development of new breeds and varieties; show quality was improved, and the stimulus of poultry shows paved the way for their real commercialization. From the time of the first poultry show held in Boston in 1849, and the first egg laying contest at Storrs, Connecticut,

poultry husbandry in the United States has increased to a business now valued at three billion dollars annually.

United States Importations

A review of the publication by Brown, "Poultry Breeding and Production," indicates several dates of interest regarding fowl importations to this country. Of the Asiatic races of fowl, the Brahma was imported in 1846, the Cochin in 1846, while the Java was known in the United States as early as 1850.

Of the Mediterranean breeds, the Leghorn was imported from Italy in 1828, the Sicilian Buttercup in 1835, and the Ancona shortly thereafter.

Few records are available concerning definite dates of importations of other races, but it is likely they appeared after the Asiatics.

Our best known breeds, the Plymouth Rock, Rhode Island Red, Wyandotte, Jersey Black Giant, and New Hampshires, were all developed in this country by crossing existing breeds and by special selection, through breeding, for certain well defined and desirable characters. It is believed that the Plymouth Rock was originated by Joseph Spaulding of Putnam, Conn. Wyandottes originated in New York State as a silver-laced variety. The whites occurred as sports from these silvers and were later bred true.

The Rhode Island Red originated in the 18th century in the region adjacent to Narragansett Bay. The Jersey Black Giants were developed in New Jersey, and the New Hampshire, in our own State of New Hampshire. This latter breed was accepted into the Standard of Perfection as a distinct breed in 1935. Originally known as New Hampshire Reds, the term "Reds" was dropped in order to prevent confusion with the Rhode Island Reds.

Poultry Shows

As far as records are available, the first poultry show was held in Boston in 1849. This show has been continued annually and in January, 1949, celebrated its 100th anniversary. At this first show it is reported that 10,000 persons viewed 1023 specimens as displayed by 200 exhibitors. From this early date, considerable impetus in the show quality of poultry developed, and in 1873 the American Poultry Association was formed. This organization in 1874 published the first Standard of Excellence, a treatise explaining the recognition of and distinguishing characters of certain breeds and varieties as standard in order to improve both "beautiful and productive" qualities. The verbal and pictorial specifications of this publication, now known as the Standard of Perfection, govern to a large extent, the operation and awards made in most all shows.*

Poultry Organizations

This very brief review must of necessity be limited in scope and accordingly we list below** only those associations active within the four states

* The American Poultry Association, as of 1947, recognized as Standard and official 75 breeds of poultry. These breeds were classified into 15 different groups with a total of 202 varieties.

These are by groups: Games and Bantams, 65; Turkeys, 6; Geese, 10; Ducks, 17; Orientals, 5; Continental, 3; French, 5; Polish, 9; Hamburgs, 6; English, 15; Mediterranean, 22; Asiatic, 9; American, 28; and Miscellaneous, 2.

** *American Farm Bureau Federation*, National Poultry Committee, Roger Fleming, Sec.-Treas., 221 No. LaSalle St., Chicago, Ill.; *American Poultry Association Inc.*, E. W. Wilson, Sec., Sta. A, Box 104, Atlanta, Ga.; *Associated Poultry and Egg Industries*, Dr. A. Van Wagenan, Secretary, Trenton, N. J.; *American Poultry and Hatchery Federation*, (formerly *International Baby Chick Association*), D. M. Turnbull, Exec. Sec., 15 West 10th St., Kansas City, Mo.; *American Poultry Historical Society*, Ralston R. Hannas, Treasurer, 180 North Wabash Avenue, Chicago 1, Ill.; *Northeastern Poultry Cooperative Association*, Berwyn B. Gehgan, Manager, New York, N. Y.; *National Council of Farmers' Cooperatives*, H. L. Brinkley, Exec. Sec., 744 Jack-

of Maine, New Hampshire, Vermont, and Massachusetts, as of January 1, 1953 with revisions as known.

Egg Laying Contests

The first recorded egg laying contest held in this country was the "Farm Laying Contest," conducted by the *National Stockman and Farmer* in 1889. This was conducted along lines very similar to our present-day home egg laying contests.

Of the so-called Standard Contests the first U. S. contests opened at Storrs, Conn., and Mountain Grove, Mo., in 1911, just 11 years following the invention of the trap nest. At the present date, only one is being conducted in New England; the Storrs Contest.

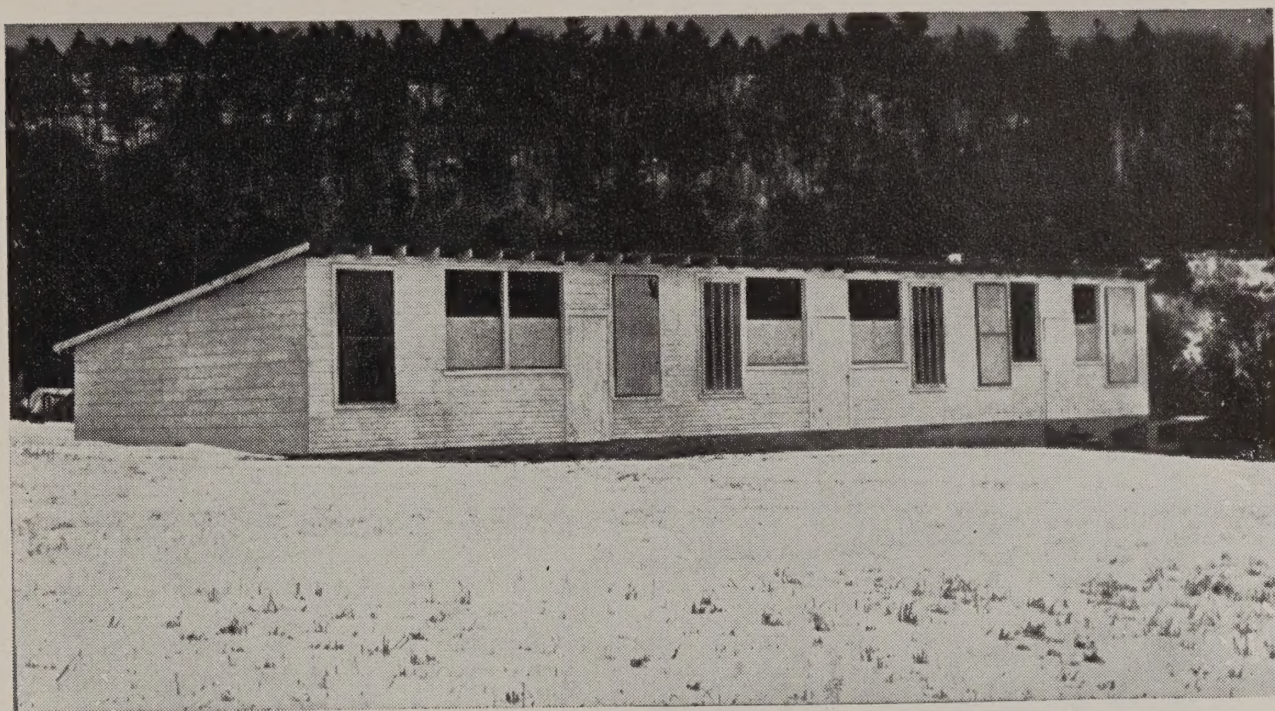
ESTIMATED AVERAGE EGG PRODUCTION PER BIRD IN THE UNITED STATES BY YEARS

1937	130	1945	151
1938	135	1946	155
1939	134	1947	158
1940	134	1948	162
1941	139	1949	166
1942	142	1950	172
1943	143	1951	175
1944	148	1952	178

son Place, N.W., Washington, D. C.; *National Turkey Federation*, M. C. Small, Exec. Sec., Mount Morris, Ill., and *Institute of American Poultry Industries*, C. D. Carpenter, President, 221 North LaSalle St., Chicago 1, Illinois.

New England Poultry and Egg Institute, Miss Eleanor Bateman, Exec. Mgr., 30 Huntington Ave., Boston, Mass.; *N. H. Club of America*, H. F. Presby, Sec., Pittsfield, N. H.; *Northeastern Poultry Producers Council*, Dr. Alfred Van Wagenan, Managing Director, Trenton, N. J.; *Poultry and Egg National Board*, Don W. Lyon, Gen. Mgr., 185 N. Wabash Ave., Chicago 1, Ill.

Maine Poultry Improvement Association, J. R. Smith, Sec.-Treas., Orono, Me.; *Mass. Federation of Poultry Assoc.*, Julius Kroeck, Sec., 41 Tremont St., Boston, Mass.; *Mass. Turkey Growers Assoc.*, Mrs. A. F. Hinds, Sec., Lexington, Mass.; *N. H. Poultry Growers Assoc.*, Richard Warren, Sec., Durham, N. H.; *N. H. Turkey Growers Assoc.*, Dr. R. C. Ringrose, Sec., Durham, N. H.; *Vermont Poultry and Egg Producers Assoc.*, H. C. Whelden, Sec., Burlington, Vt.; *Vermont Turkey Growers Assoc.*, Mrs. R. H. Wyman, Sec., N. Hartland, Vt.



Shed-roof type house with sliding curtains and slot-type ventilator, outlets above front plate and between rafters.

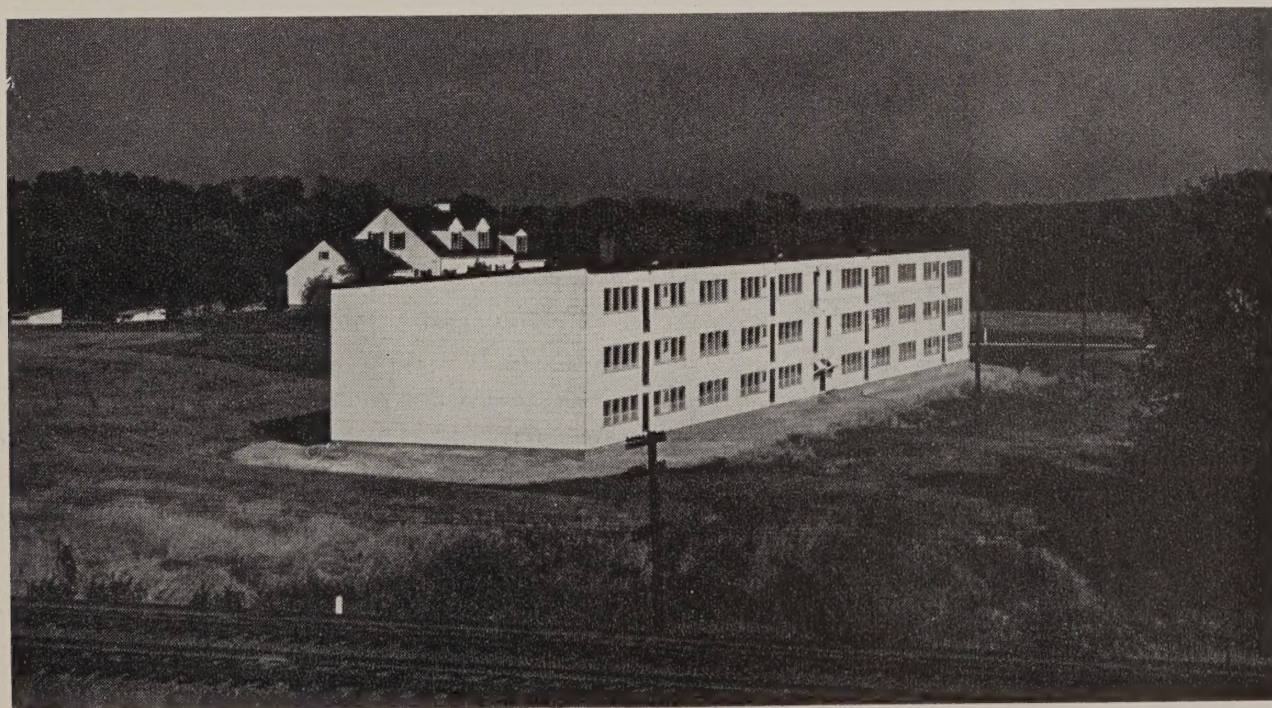
The all time high record pen is held by White Leghorns of Babcock Poultry Farm, Ithaca, N. Y. This pen in 1945, at the Western New York Contest, established a total point value of 4336.25, having produced 4057 eggs.

The all time high record hen is a Rhode Island Red entered by E. B. Parmenter in the Western N. Y. Contest (1943) with a record of 351 eggs and 386.1 points. A White Leghorn

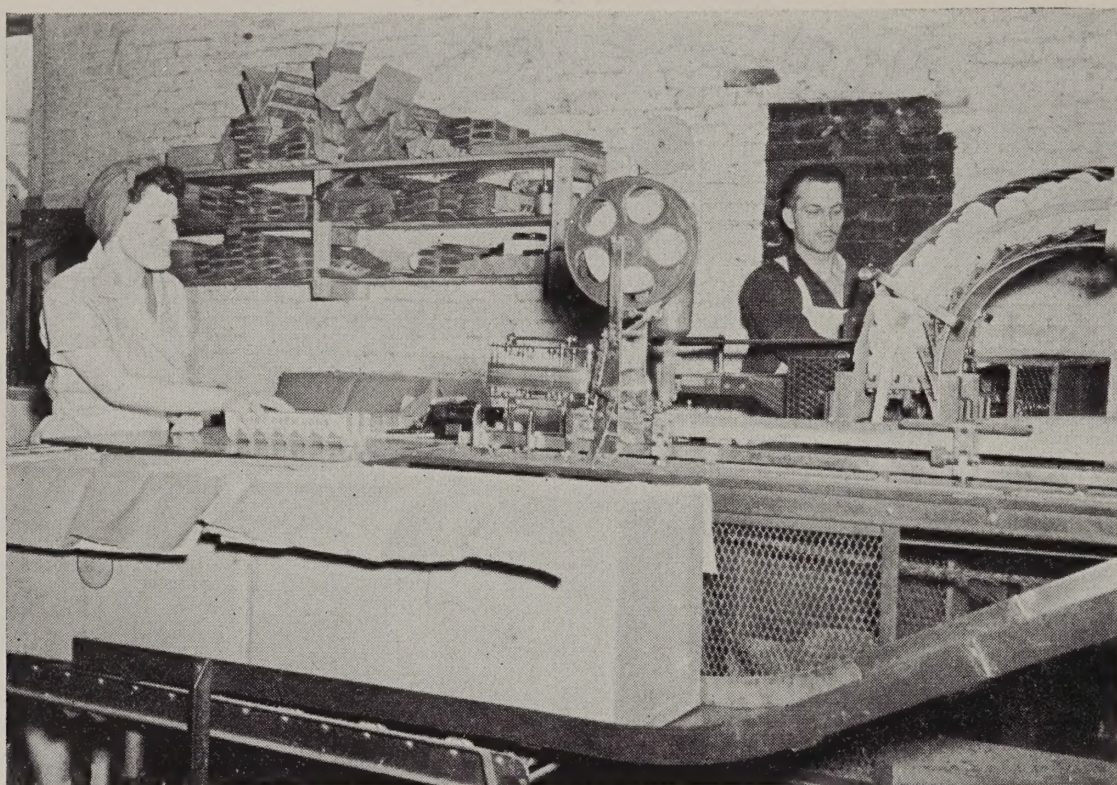
bird entered by J. A. Hanson and Son in the same contest in 1950 exceeded this production by two eggs, but totalled only 381.35 points.

The first American turkey laying contest was started January 1, 1947 at the John Tarleton College, Stephenville, Texas.

Standard Rules and Regulations under which Egg Laying Contests operate include:



A modern laying house on one of New Hampshire's progressive poultry farms.



Automatic egg carton former and sealer.

1. The test shall begin on October 1.
2. Fifty-one weeks of continuous record shall constitute the official laying period.
3. An entry consists of 13 birds, and record of all 13 shall count as the pen total.
4. Replacements are allowed only during the first two weeks of the contest period.
5. The point system of scoring is used in making awards.

Point System of Scoring

EGG WEIGHT Ounces per dozen	SCORE Points per egg
18	.70
19	.75
20	.80
21	.85
22	.90
23	.95
24	1.00
25	1.05
26	1.10
Over 26	1.10

Events in Poultry Housing

Previous to about 1850, practically no attention was given to the housing of poultry. Chickens were considered a necessary evil by most farmers and were kept primarily to provide the few eggs required by the farmer's wife in cooking. Birds were generally allowed to range, feed, and roost as they chose, acting as scavengers about the farm.

With the increased demand for both eggs and meat, the period up to 1890 saw almost every kind of available box, lean-to, and shed being utilized for sheltering chickens. The first open-front type of house appeared at the University of Maine in 1903. After this, the development of large or mass units of 500 birds or more slowly progressed up to 1915. Since birds were found to do so well in these mass unit houses, additional emphasis was placed along this line, and houses of several hundred feet in length and several stories high are now quite common on commercial poultry farms.

Long, narrow depth houses were found impractical because of drafts with poor ventilation. Depth was increased, solid partitions between pens added, restricted or controlled ventilation installed, primarily through recommendations of workers in Massachusetts and Connecticut, and today we have houses that are really comfortable and convenient to operate.

Important Early Dates in Incubator Manufacture

1896—First large incubator, 20,000 egg capacity, built by Chas. A. Cy-

- phers on Truslow Poultry Farm at Stroudsburg, Pa.
- 1906—Large capacity incubator placed on market by Cyphers Incubator Co.
- 1916—First successful room incubator developed by Dr. S. B. Smith.
- 1920—Sectional “still air” incubators being double-decked for greater capacity.
- 1920—Smith & Buckeye Incubator companies announce commercial production of mammoth incubators.
- 1922—Forced draft room incubators first offered for sale in quantity.
- 1923—Petersime electrically heated incubator announced.
- 1924—Newtown, Wishbone and Miller-Ideal offered “still air” triple deck incubators. MacKay (James Mfg. Co.) built four decks high.
- 1926—Sales of sectional incubators begin to decline.
- 1926-27—Mammoth incubators totaling 50 million egg capacity sold in one year, leading to overproduction of chicks in 1927 hatching season.
- 1928—Taggart discovers that higher humidity leads to improved hatches and better chicks.
- 1929—Bundy introduces separate hatcher method.
- 1940—Single stage method of incubating together only eggs in same stage of development announced by Jamesway.
- 1930-1950—Steady improvement in development of automatic temperature and humidity controls. Automatic egg turning introduced.
- 1952—At San Francisco APHF convention, Prof. E. M. Funk of Missouri announces improved hatches through multiple-plane egg turning.

—*Hatchery & Feed*, October 1952.

Transportation

The poultry business became more and more commercialized with the increase in number and population of

cities. This subsequent greater demand for products caused many new developments in marketing, of which transportation is a part.

Railroads now transport only a small part of marketable poultry produce.

“A greater percentage of poultry products are shipped to market by truck than any other type of farm product. Ninety-nine per cent of live poultry sent to principal markets goes by truck, only one per cent by rail. The big majority of shell eggs are shipped by truck, and over 75 per cent of dressed poultry.” — *Hatchery & Feed*, February 1952.

Previous to 1880, eggs were packed in large barrels of 70 dozen eggs, more or less. Hay, straw, and chaff served as packing materials. In 1880, the 30-dozen case appeared and later (in the early 1920's) the cup flats became available and helped to prevent damage to eggs in transit.

By about 1895, eggs could be shipped cross-country under refrigeration.

Aside from horse, rail, truck, and ship, the opening of air transportation has brought new problems and opportunities in transportation.

Over the last few years a considerable number of baby chicks now ride the air to their destination. Chicks can be and are being sent coast to coast by air transport.

Auctions

The buying and selling of produce through the auction method is not new. It has been found, however, that cooperative auctions, as established in the Northeast for the marketing of eggs and poultry, were developed because of a profound need for an adequate method of meeting marketing competition and returning just values to the producer for his products.

These auctions have had rapid growth since the initial auction at Toms River, N. J., on June 2, 1930. Since this time about 60 cooperative egg and poultry sales outlets have been developed in the Northeast.

The auction method of selling has been supplanted in most of these cooperatives by direct selling.

This past year a new organization has been formed as a "Cooperative of Cooperatives." Nine of the original Northeast cooperative auctions have banded together with Neppco leadership and help. Named the Northeastern Poultry Cooperative Association, Inc., its purpose is to more adequately represent member cooperatives on terminal markets and to serve as a stabilizing influence against market surpluses.

Breed Improvement

There have in the past been many individual as well as state programs designed to provide for various degrees of breed improvement. None of these, however, was integrated with any other, and the programs were pointed toward variable details of attainment. As a consequence, while some advance was made, overall progress was lacking.

Since 1935, the National Poultry Improvement Plan has accomplished this much needed integration of efforts and today is a real help in the improvement of all breeds, varieties, and strains of poultry.

Its objects are: (1) Establishment of a sound poultry breeding industry, (2) proper definition of quality through

uniformity of terms, (3) reduction of mortality by control of pullorum disease, and (4) optional plan of use and compliance with regulations.

We suggest that all poultrymen thoroughly familiarize themselves with the plan and use it. Though still an optional plan, its values are progressively greater as more participants enroll. With this progression, an outsider soon feels a measure of compulsion to take part or be left holding "the short end of the stick."

At the present time, 47 states are actively participating in the breeding stages and in the pullorum classes of the plan. This participation includes approximately 4½ thousand hatcheries covering some 37 million breeding birds.

1951 CASH RECEIPTS FOR POULTRY
AND POULTRY PRODUCTS*

State	Value (\$1000)	Percent of Total Farm Receipts
New Hampshire	34,858	50.9
Massachusetts	88,189	41.8
Connecticut	65,029	38.9
Maine	63,448	35.2
Rhode Island	8,406	32.0
Vermont	11,046	9.3
New England	270,976	35.0

* Based on data of Bureau of Agricultural Economics compiled by *Farm Finance News*.

Egg Formation and Egg Quality

The old problem as to which came first, the chick or the egg, has bothered many folks since the world's beginning. It is argued that without the female chicken there can be no egg, and without the eggs there can be no female chicken. Nevertheless, both products are with us today, both are essential to a well balanced diet, high in nutritive value, and from recent reports, each person in this land of ours ate about 350 eggs, on the average, during 1944; 387 in 1945; 374 in 1946; 379 in 1947; 386 in 1948; 381 in 1949; 386 in 1950; 397 in 1951, and 406 in 1952.

The egg*, properly defined, is "a mature female germ cell together with its surrounding envelopes each of which have definite functions which serve toward the perpetuation of the race."

Besides the factors listed below, eggs are a good source of calcium, iron, iodine, phosphorus, and copper, all of which play an important role in the mineral requirements of humans. They are excellent sources of vitamins A and B₂ or riboflavin.

Egg quality, from the standpoint of nutrient elements, is influenced to quite a degree by the diet fed to the egg producer. New England poultrymen have realized that quality must be high to compete profitably with imported eggs. The maintenance of a high nutritive value in eggs is assured through use of fresh Merrimack Feeds, "Made Today—Fed Tomorrow."

* THE COMPOSITION OF HENS' EGGS

	Per Cent		
	Yolk	White	Whole Egg
Water	46-52	80-88	70-76
Fat	30-35	trace	9-14
Protein	14-16	10-13	10-15
Shell and shell membranes	0	0	9-12

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Egg Development

During early embryonic development of the female chick, two ovaries are present. Eventually, the right ovary degenerates and only the left grows to maturity. It is extremely rare to find a bird having both right and left ovaries. Likewise, a bird possessing two separate oviducts and vents is very rare. The picture below shows a turkey hen with a double vent.



A double-vented White Holland turkey from Rosmore Farm, Grasmere, N. H.

(U. N. H. Photo)

The functioning ovary contains, at hatching time of the chick, some 3000 or more minute yolks. Some of these mature and supply the needs of the producer throughout its life. At sexual maturity, certain of these minute yolks start a period of very rapid development and after about one week a mature yolk drops from the ovary into the body cavity, or into the mouth of the oviduct.

This oviduct is the passageway through which all yolks must travel on their way to completion into a final egg. The funnel or mouth of the oviduct scoops up this dropped yolk and by means of muscular action forces it into the albumen secreting area, or magnum. If the egg is to be fertilized, the male sperm enters the germinal disc of yolk before the deposition of the

albumen. About half of the total albumen is then deposited. This yolk and its albumen continues its passage in a rotary motion. Part of the albumen is twisted into so-called cords or chalazae. They are easily seen on either side of the fresh, opened-out egg.

Following into the isthmus, water and salts are added to the albumen, and two shell membranes are deposited over this albumen. The developing egg next enters the uterus and vagina, where additional water and salts filter through the membranes and complete the albumen content. The shell is formed over the outer membrane and color may be added. A bloom or gelatinous covering partially seals the pores of the completed egg.

This completed egg has the body temperature of the hen, 106 to 107° F. Upon expulsion it cools. This cooling causes contraction and outside air is drawn into the egg between the inner and outer shell membranes to form the air cell, usually located in the large end of the egg.

AVERAGE TIME CONSUMED IN EGG FORMATION

Part	Time	Length of Passage
Funnel	18 minutes	1 1/4 inches
Magnum	2 hrs. 54 min.	16 inches
Isthmus	1 hr. 14 min.	4 1/4 inches
Vagina } Uterus }	20 hrs. 40 min.	6 inches
Total	25 hrs. 6 min.	27 1/2 inches

Factors Affecting Exterior Quality

The quality of eggs from the standpoint of both market value for human consumption and for hatching purposes is influenced by both exterior and interior factors. High quality is as important in hatching eggs as in market eggs. Proper care for one is proper care for the other.

Separating these external factors, we find that size, color, and shape are considered inherited characteristics. With this in mind, there is little the average

egg producer can do to improve these factors. Proper selection and breeding of birds with desirable characteristics, however, brings breed improvement.

Eggs with an average weight of 2 ounces will, in 30-dozen lots, weigh 45 pounds. The average weight of a wood case and fillers (12 pounds) will bring the gross weight of a case of large eggs to 57 pounds.

MINIMUM GROSS WEIGHT PER CASE FOR NEW HAMPSHIRE EGG GRADES

Weight Class	Gross Weight Per Case*
Extra Large	57 1/2 pounds
Large	52 pounds
Medium	46 1/2 pounds
Small	41 pounds
Pee Wee	Under 41 pounds

* Approximate tare 7 lbs. The weights per case as listed in the above table imply packing in fibreboard cases. Should you pack in wood cases, these figures may be 7 pounds more. It is well to remember, however, that eggs when packed should be somewhat heavier than minimum to allow for possible shrinkage during shipment.



Correct weight recording of your eggs should be a requisite of all sales.

The influence of the parts of an egg on egg weight has been reported approximately as follows: Albumen, 58 per cent; yolk, 31 per cent; and shell and shell membranes, 11 per cent.

Most investigators believe that body weight and egg weight are closely related. In other words, the larger bird lays the larger egg. Exceptions always occur but, as a rule, the smaller the bird at the time of sexual maturity the smaller the eggs she will lay. If the grower of egg-producing birds will allow just a bit longer time during the growing season, the body size as well as size of the first eggs laid will be improved.

Some birds lay eggs of tinted white, others of pure white; some lay dark brown eggs, others are of a light buff shade. In general, these variations are individual bird characteristics and since uniformity is desired, selection for this preferred color is essential. When selecting eggs for color, use exposure of the forenoon light from the north or blue glass electric lights.

A recent development has been the invention and manufacture of an automatic color grading machine for eggs. This is based on the absorption or refraction of black light. The lighter the shell color, the greater the refraction and thus, color grades of about six differentials can be selected. This machine, though costly, will soon be commercially available

Shape of eggs varies to a considerable degree as each daily collection is made. Factors influencing this character have been listed as: quantity of albumen secreted, size of oviduct in region of isthmus, and muscular action of walls of the oviduct.

The shell texture is related more to the individuality of a hen than to either breed or strain. Under trap nests, certain birds will persist in laying eggs of variable poor texture. Calcium deposits, porous shells, and thin shells or even shell-less eggs are found.

The average normal shell thickness is about 1/70 of an inch, and such an egg should withstand a pressure of 7 or 8 pounds when applied against two hard surfaces.

Poor shell strength or texture may be due to insufficient intake of calcium. Quite often oyster shells or other calcium supplements are provided, but the birds do not eat them. It is well to check up and determine whether your average layer is consuming some 5 to 6 pounds of oyster shells per year.

An after-effect of bronchitis in laying birds is very poor egg shell texture. While no cure for this condition is available, the condition usually clears up after several months.

When some eggs are candled, they show variable translucency. These translucent areas result from uneven moisture content in the shell and may be changed by drying or moistening the atmosphere about the shell. This condition should not be confused with porosity.

Egg shell cleanliness will influence, to a marked degree, the market value of eggs. The methods of control should be self-evident, but let us list them as follows:

PERCENT CHANGE FROM 1940 TO 1950 IN NUMBER OF FARMS WITH CHICKEN FLOCKS OF SPECIFIED SIZES, BY STATES FOR NEW ENGLAND:
CENSUSES OF 1950 AND 1940

State	Under 50	50- 99	100- 199	200- 399	400- 799	800- 1599	1600- 3199	3200+
New England	—37	—34	—27	—21	— 9	+31	+106	+ 277
Maine	—39	—31	—31	— 3	+15	+85	+221	+ 723
New Hampshire	—29	—27	—22	— 9	+ 8	+37	+ 78	+ 188
Vermont	—33	—31	—19	— 2	+37	+51	+169	*+2000
Massachusetts	—42	—39	—26	—25	—17	+26	+ 86	+ 176
Rhode Island	—28	—40	—42	—30	— 5	+21	+142	+ 183
Connecticut	—37	—38	—30	—39	—31	+ 7	+ 96	+ 346

* One flock in 1940; 21 flocks in 1950.

1. Clean litter on floor.
2. Clean litter in nests.
3. Adequate nesting space.
4. Wire-covered drop boards or pits.
5. Frequent collection.
6. Dry pens.
7. If dirty—clean before sale.

Egg Cleaning and Washing

(The following information on Egg Cleaning is taken from Neppco News, January 20, 1953.)

Various methods are used for cleaning eggs, such as the use of scrapers, sanders (sandpaper or emery cloth), steel wool, damp cloth, sand blast, lye solution, and soaking in water. All of these methods, more particularly the last, do four harmful things. They may remove the gelatinous coating, make eggs shiny, allow rapid entrance of bacteria, and may result in a reduced price for eggs sold. That old saying,

“an ounce of prevention is better than a pound of cure,” certainly applies here.

The keeping quality of eggs is important to the successful marketing and merchandising of this major product of the poultry industry. Eggs are a perishable commodity. Like milk, egg meat is one of the best foods, not only for man, but also for bacteria. These bacteria, when introduced into eggs, grow rapidly and quickly spoil them under proper conditions of temperature. Fortunately, the egg has certain protective devices in its structure that help to prevent the entrance of bacteria. But the fact remains that bacteria can enter the egg and when they do in sufficient numbers, trouble begins.

The bacteria that cause spoilage are present everywhere, particularly in the

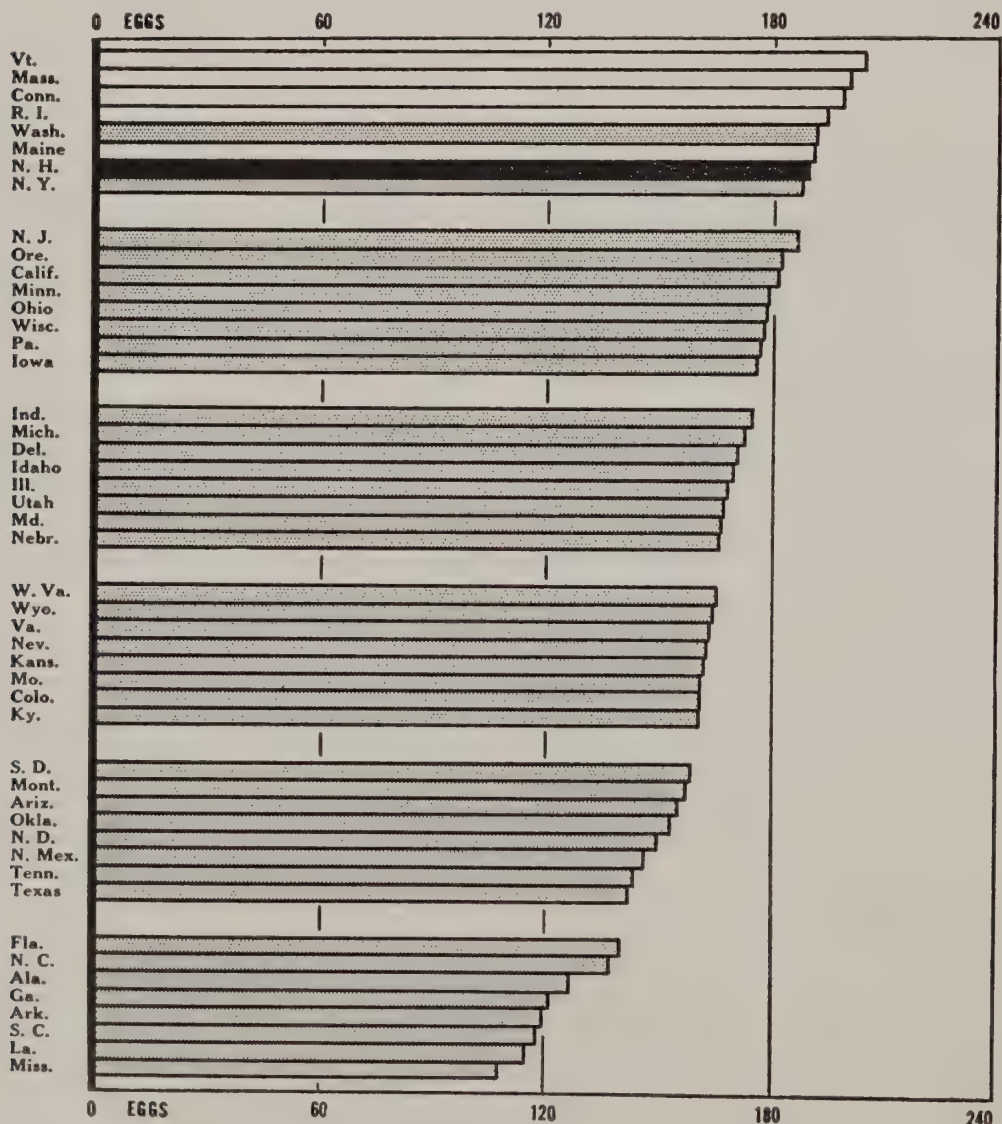


FIGURE 1. Average egg production per hen, by states, 1949.
Data from Bureau of Agricultural Economics.

soil, litter, nesting materials, water, in fact, everywhere that eggs are produced and handled. The milk industry found from experience that the only way it could supply good sweet milk to consumers was to follow a complete sanitary program to prevent the infection of milk by the bacteria that cause spoilage. The sanitary program for milk production was more imperative than with eggs, because milk is not supplied by nature with protection similar to that provided the egg by the shell.

For years, it has been known that eggs will spoil more readily when they have been wet. For years, marketing men and teachers have preached the importance of producing eggs clean and using dry cleaning methods on the inevitable dirty eggs. In recent years, there has been economic pressure from steadily increasing numbers of layers per man, coupled with the relaxation of the extra effort to produce only clean eggs, because production of numbers was more important than quality. Means have been sought to reduce the labor needed to clean eggs. Cleaning by washing was the answer. Poultrymen were sold machines to wash eggs, or taught to wash by hand, and many did so successfully with no harm to the product. But others did not follow the principles of sound sanitation necessary in cleaning eggs, and experienced dire results. "Exploders" appeared in the incubators, market men were plagued with spoiled eggs and angry customers, storage men had severe losses—all tending to reduce confidence in eggs, and causing a very real, though not readily apparent, reduction in demand, especially for nearby eggs, where washing was most prevalent.

It is interesting to note that a great many of the outstandingly successful egg washing operations are conducted by either dairy operators or poultrymen who practice sound sanitation as fundamental to their operations. Much is still to be learned about cleaning eggs by washing. The process is still controversial, among experiment sta-

tion men and researchers, as well as market men. The poultrymen should look upon washing eggs as a *privilege* which entitles him to a better appearing product, and considerable labor saving, but only at the expense of careful work and sanitary control. If he disregards the rules, he will lose the advantages.

Let us review the principles involved, as we know them today, always bearing in mind that, in a new process, one must be constantly alert to new discoveries and accept them only after they have been carefully checked.

1. The egg is perishable, an excellent food for growth of bacteria.
2. The bacteria which cause spoilage are present everywhere, especially in the soil, grow rapidly when given food, moisture and warmth, and move by swimming in water.
3. The egg shell is porous, and bacteria can move through it when moisture is present. This movement is helped by the suction created by cooling the eggs in cool water. The movement is hindered by the pressure created by warming them in warm water. Always have any solution used with eggs, *warmer* than the eggs. Recommended temperatures, 110° to 130° F. for immersion.
4. There is no known practical method of killing the bacteria, once they are inside the egg. Therefore, the objective is to *prevent* the bacteria from entering the eggs. This can be done by producing eggs as clean as possible, keeping them clean, and exposing them to as little danger of infection as possible. Keeping everything that comes in contact with eggs clean and sanitized, including the room in which eggs are kept, and cleaning and sanitizing as promptly as possible after cooling, to remove the infectious dirt is also necessary.
5. Since washing supplies the necessary water for the bacteria to swim, and since it obviously becomes infected, the wash solution should contain an

approved sanitizer to kill the bacteria that are washed off into it, and to prevent the transfer of the bacteria to other eggs.

6. Sanitizers that are considered safe to use with human food products, available today, are "used up" as they do their job and eventually become ineffective. The solution must be renewed frequently enough to maintain the potency of the solution.
7. The eggs should be dried promptly and packed only when thoroughly dry in clean, preferably new, material.
8. In no case should eggs be immersed longer than is necessary to clean them, and in any event, not more than three minutes. Follow the instructions for the method you use.

Summarizing — Use solution temperature of between 110° and 130° F. Immerse no longer than 3 minutes. Use a *detergent-sanitizer* designed for egg cleaning and change it frequently.

Washing is no substitute for cleanliness in production or handling. It can do you and your industry great harm if not done right. We repeat — IF YOU CAN'T OR WON'T WASH EGGS RIGHT, DON'T DO IT!

Determining Interior Quality

Interior quality of eggs may be determined in one of three ways; by breaking eggs open, by floating them in water, or by candling. The high quality fresh egg when opened shows a large, outstanding yolk, a minimum of thin or watery albumen (white), a thick, viscous ring of albumen immediately adjacent to the yolk, and no abnormalities.

When a fresh, high quality egg is placed in a pan of water it will immediately sink to the bottom. On the other hand, a shrunken, poor quality egg will float. The greater the size of air cell within the egg the higher it will float.

By candling, we refer to the common practice of examining the interior of an



Two egg washers: top, the Wright, below, the Whirlaway.



egg by holding and twirling it before a strong light coming through an aperture in an opaque box or shield. By candling, it is possible to determine the size of air cell, condition of shell, relative movement of yolk, presence of abnormalities, development of germ disc, and approximate density of albumen. Having determined these factors, the operator is then able to sort the eggs into various grades.

For commercial candling of eggs we recommend the use of ready-made candler. It is, however, quite easy to make one at home from a small wooden box or tin can with a removable lid, large enough to insert a light bulb. Allowance should be made for space around the bulb to provide ventilation

made possible by small holes in the top of the candler. On one side cut a hole $1\frac{1}{4}$ " in diameter, through which the light rays will pass when the bulb is inserted. The whole device can be attached permanently to a bracket at a convenient height.



Egg appearance before the candle. Note the poor quality indicated by deep air cell. Top-quality eggs show air cell circumference about the size of a dime.

When candling, eggs are held in a slanting position with the large end of the egg upward and in front of the candler aperture. By giving the egg a slight, quick twirl the interior contents will move and the yolk can be seen. All of the quality factors noted earlier can be determined in this operation.

All of our New England States have passed so-called Fresh Egg Laws and all dealers, retailers, producers, and handlers of eggs are subject to the restrictions as required by these laws. They are, in general, very similar to each other. Space does not permit reprinting these laws, but you should familiarize yourself with the law and act accordingly.

Factors Influencing Interior Quality

Let us first of all recall that once an egg has been laid, its quality cannot be

improved. Any improvement, therefore, must be made before the egg leaves the hen's oviduct. After laying, all effort expended is to maintain original quality and retard further deterioration.

Certain exterior quality factors are influenced or controlled largely by inheritance. This is true also for certain interior quality factors. Breeding plays a big part, hence, the first step is to breed for high quality factors and eliminate individuals responsible for production of low quality eggs.

Feeds or method of feeding may influence interior quality through color of yolk, thinness of albumen, taste or odor, and nutritive value. In the first case, uniformity of color is of more importance than is density of yolk color. It is an accepted fact that uniform colored yolks are more common from All Mash fed birds than from those fed mash and scratch feed. Such variation occurs because the coloring value (xanthophyll pigment) of mash is different from that of grain. Some birds eat more of one than the other, which accounts for variation in yolk color.

Yellow corn, corn gluten meal, alfalfa, and green feeds increase pigment, whereas oats, wheat, barley, and their by-products carry no xanthophyll pigment and result in lower density of yolk color. Certain markets desire deep-colored yolks, whereas others want the lighter color. Either can be produced by varying the pigment value of feed. Excess use of rape, cottonseed meal, and shepherds purse will cause deep orange to olive-colored yolks.

Excessive feeding of succulent green foods has been given as the cause of thin albumen. For the most part, however, this is controlled by heritable factors. The breakdown of original thick albumen to thin albumen is a normal occurrence due to age and poor holding conditions.

It has been reported that laying birds which carry excess fat have a tendency to lay eggs showing more blood spots

and thin shells than the normal weight and condition bird. No facts are available to prove this contention but it may be worth checking.

Objectionable taste or odor may also be inherited factors, but can be caused by excess use of rancid feeds. Experiments reported by the University of New Hampshire, where fish meal was fed at the exceptional level of 13 per cent, showed no effect on either taste or odor of eggs. Eggs absorb odors readily, and when placed near onions, oranges, or oils, will take on a taste and odor of these products. Be careful where you store eggs.

Eggs are highly nutritious and their vitamin and other nutritive values may be influenced by feeds. Use Merrimack Feeds to bolster the food value of eggs produced on your farm.

NUTRITIVE VALUE OF EGGS*

	Recommended Daily Allowance for Moderately Active Man	Quantity in 1 egg
Energy, calories	3000	95
Protein, grams	70	6.6
Calcium, grams	0.8	0.03
Phosphorus, grams	0.9	0.12
Iron, milligrams	12.0	1.0
Vitamin A, I.U.	5000	500
Vitamin D, I.U.		50
Thiamin, milligrams	1.8	0.093
Ascorbic acid, milligrams	75	0.0
Riboflavin, milligrams	2.7	0.190
Nicotinic acid, milligrams	18	0.04

* The Nutritive Value of Eggs and Poultry Meat, H. R. Bird

Egg Abnormalities

Meat and Blood Spots: Hemorrhages which occur prior to egg expulsion, while egg is still in the stage of completion and before membrane or shell is applied, have been reported as the true cause. The so-called meat spots are blood spots which have undergone an oxidative transformation. The tendency to produce such abnormalities is inherited and little

can be done by the egg producer to reduce their incidence.

Bloody Eggs: Hemorrhages of greater extent than those causing blood spots are the cause. Blood mixes completely with albumen of egg.

Multiple Yolks: Two or more maturing yolks enter the oviduct passage at about the same time and are enclosed within the one shell. Happens most frequently during first stage of production period when yolk rate of maturity is in exalted condition.

Body Check: A shell broken in travel through oviduct but healed over before expulsion. Rough handling of birds or external injury is probable cause.

Blind Check: A cracked shell which is discernable only under the candle.

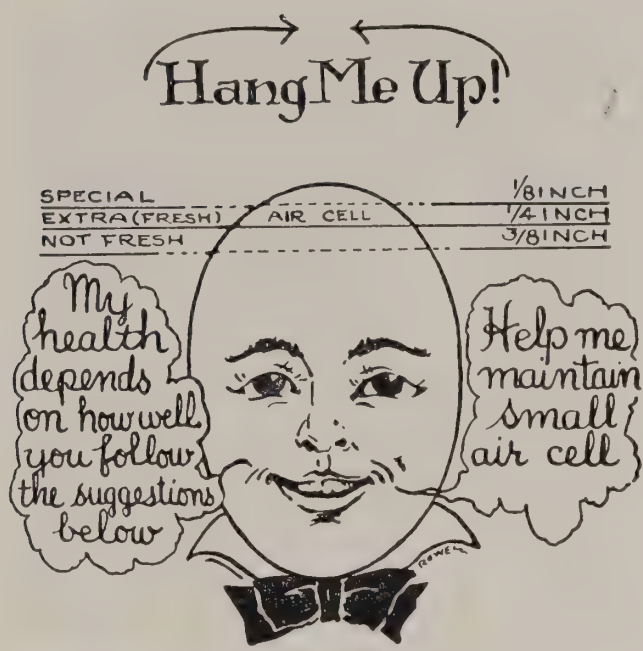
Bubbly Air Cell: Inner shell membrane has ruptured allowing air to mix with albumen. This occurs as bubble formation and is free to move about contents. Rough handling of eggs may be cause.

Egg Within an Egg: Two complete eggs, the inner encased by the outer and larger. Probable cause, inner egg held from expulsion at completion, reverse peristalsis of oviduct occurred, and egg met new yolk coming at upper end of tract. Regular peristalsis started and both expelled as one very large egg. Variations of contents may occur.

Care of Market and Hatching Eggs

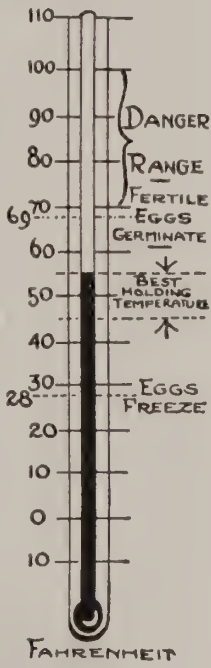
All measures successfully used to maintain market egg quality will serve as well for hatching eggs.

It is well to remember that the embryo will start its development at a temperature of 69° F. The temperature of the eggs at time of laying is 106° F. If this fertile egg is not rapidly cooled below 69° F., germ development immediately proceeds. The further this development before cooling, the greater the chance of embryo mortality during a subsequent incubation.



Suggestions for the Maintenance of High Egg Quality

- 1 - Gather us 3 times daily.
- 2 - Use open wire basket in preference to solid sided pail.
- 3 - Take us immediately to a cool room: — 45° F. to 55° F.
- 4 - Allow us to cool at least 12 hours before packing.
- 5 - Do not put us in a warm case — Cool it!
- 6 - Since we are going visiting make us clean and attractive.
- 7 - Replenish nest litter often.
- 8 - Pack us carefully in clean fillers and flats with our chins down.
- 9 - If we must be held at home for a few days keep us in a room which is cool and moist.
- 10 - Ship preferably twice each week.



tion period. Arrest this early development period as soon as possible for better hatching egg quality. Note the temperature and humidity indicated in the photograph on page 20, 55° F. temperature and 85 per cent relative humidity. Place your eggs under such holding conditions immediately after collection.

Suggestions for Maintenance of High Egg Quality

- 1. Collect eggs three times daily in summer and four in winter.
- 2. Maintain dry, clean litter and nesting material.
- 3. Replace floor and nest litter when wet or dirty.
- 4. Cool eggs rapidly and then pack in cases for holding until sale.

- 5. Egg holding room should be kept at 50° to 55° F. and approximately 70-80 per cent relative humidity.
- 6. Pack eggs in cases with small end down.
- 7. Use a V-shaped case-holding rack and turn cases from side to side alternately each day during holding period.
- 8. Do not hold eggs for market or hatching purposes longer than 7 days.
- 9. Insulate egg cases during cold weather to prevent freezing or severe chilling in shipment.
- 10. When packing and sorting hatching eggs, select only those with smooth, strong shells. Eliminate odd shaped, porous shelled, and extremely large or small eggs.
- 11. Store packing materials in a cool, moist room to prevent absorption of moisture from eggs or transfer of heat to eggs when packed.
- 12. Use clean, sound fillers and flats in packing.
- 13. Make sure case bottoms are nailed securely before cases are filled.
- 14. Market eggs frequently.
- 15. Where mold appears due to high humidity in the egg room, use copper sulfate solution of about 1 ounce dissolved in 2 gallons of water as a spray or wash for walls and floor. Air circulation will minimize appearance of mold.

Packing of Eggs

Sellers of goods are, by custom, responsible for packaging their produce. The producer of eggs must furnish the case, and the market price quotations are normally taken by most all buyers to indicate the price per dozen, including package. In time of free supply of cases, this factor is of small import to the producer, but when packages are scarce and high in price, this factor is extremely important from a cost basis.

The standard case to hold 30 dozen eggs is usually and preferably constructed of cottonwood because of the absence of odor, lightness in color and weight, and toughness due to the long fibre of the wood. Other woods as tupelo, spruce, and gum, are also used. Fibre or cardboard cases are now replacing the wood case.

Standard measurements include sides, top, and bottom of 3/16" material, center and ends 7/16" thick, and end cleats 1 1/4" x 7/16". The two compartments, each holding 15 dozen eggs,

have an inside measurement of not less than $11\frac{3}{4}$ " square by 13" deep. The over-all dimensions of the complete domestic wood case are $13\frac{3}{8}$ " high, $12\frac{1}{8}$ " wide, and $25\frac{7}{8}$ " long.

Orange or citrus fruit cases can be converted to hold 30 dozen eggs by nailing a $\frac{7}{8}$ inch strip of wood to the end boards and center partition. This increases the depth of box so as to take the required fillers and flats.

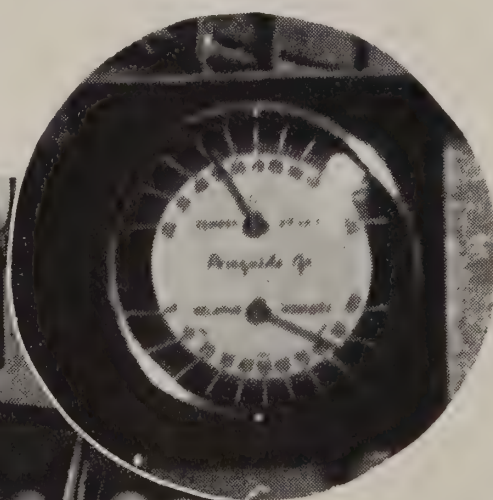
General rules which may be suggested and which are applicable to all egg packers are as follows:

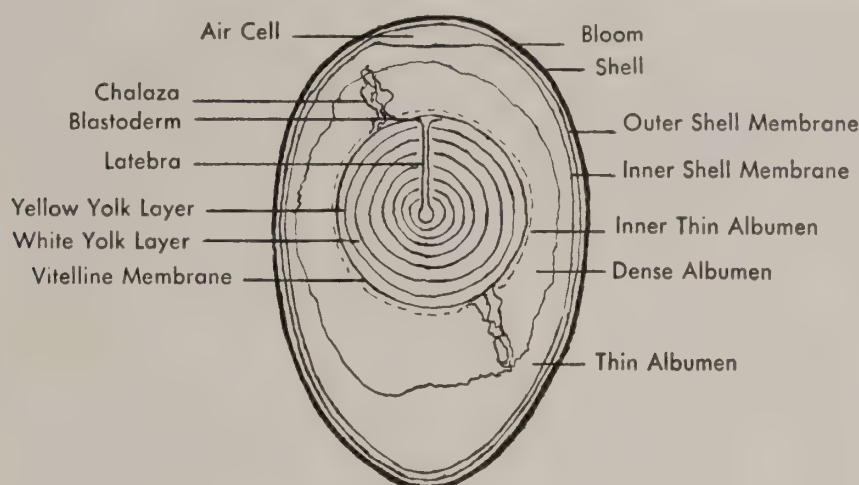
1. Pack eggs large end *up*. This provides for better appearance, greater strength and resistance to breakage as well as protection to contents.
2. Do not "top" cases. Do not try to falsify appearance by special selection of eggs on top layer and attempting to hide poor grade eggs on the lower layers. All cases are usually inspected by the purchaser.
3. Tip long eggs to one side in order to prevent their projection above fillers.
4. Extra long eggs fit best in the corners. They are not as easily crushed there as they would be if placed in the center.
5. Clean eggs before packaging.
6. Use clean, fresh, odorless, and preferably new materials. Ten fillers and twelve flats are used per case of 360 chicken eggs, whereas 10 flats and 8 fillers (turkey or duck style) are used per case of 200 turkey or duck eggs.

Ideal temperature and humidity conditions for holding market eggs.



A specific requirement for hatching egg producers during winter season. Newspapers serve very well as an insulation blanket to prevent effects of rapid temperature changes.





Cross section of an egg showing its parts.

7. Lining of cases may be advantageous from standpoint of appearance and protection from severe weather.
8. Before packing see that the bottom is nailed securely with threepenny cement-coated, large-headed nails.

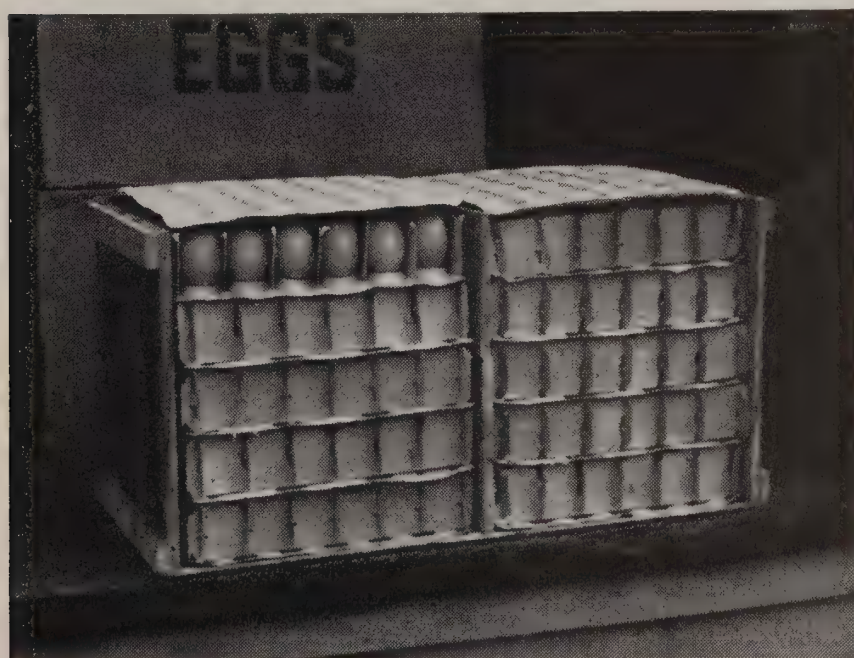
Preservation of Eggs

Good quality eggs may be preserved for future use in a variety of ways and when properly handled will maintain their original quality for many months. Shell eggs have been preserved by packing in dry table salt, bran, sawdust, wood ashes, salt brine, slaked lime, sugar lime water, water glass solutions, dipping in sulfuric acid, sealing in glass jars, and by coating with paraffin, vaseline, or lard.

Probably the best method has been that of water glass or sodium silicate solution. In using this procedure, a clean 5-gallon crock which can be cov-

ered is essential. About 14 or 15 dozen eggs can be packed in such a container. Select clean, sound shell eggs only, of high interior quality. Place them in the crock and cover with a solution of 1 quart of water glass in 9 quarts of water. Boil and cool the water before water glass is added. Make certain that the solution covers all eggs by at least 1 inch, cover, and keep in a cool place. More eggs or solution may be added later if desired and as others are used.

If the limewater method is desired, the following method may be followed: Slake 3 pounds quick lime in small quantity of water, mix with 4 gallons of pure water, add 2 pounds of salt. Stir thoroughly and allow to settle, then pour off the clear liquid. To this add 4 ounces boracic acid (H_3BO_3). This solution is enough to preserve about 30 dozen eggs similar to the water glass method.



A proper package arrangement for a 30-dozen lot of eggs. It includes 10 new strong fillers and 12 clean cup flats. The side of one filler is removed to show eggs placed on small end.

Feeding and Care of Baby Chicks

The future of all chicks as they are placed under the brooder stove by the poultryman has already been largely determined. The baby chick has inherited many factors from its parents which will chart its road to success or failure in the hands of the grower. Those persons in charge of growing the chicks cannot improve upon these inherent possibilities.

Since many factors have already been determined through the mode of inheritance, it should be the prime motive of every grower of baby chicks to carefully select the source from which they come. Price alone is not the determining factor. A low-priced chick is sometimes considered as "cheap," but it may prove extremely costly.

Be particular where you buy chicks. Visit this source personally, if possible, to see how the parents of anticipated chicks are performing. Are they high producers, do they support high hatching power, do they lay large, well-shaped eggs, is livability high, is cannibalism bothersome, is broodiness a common trait, what is the disease background? These and many other questions should be answered and the source providing most of the desired qualities selected. Never buy chicks from a pullorum-infected source. New England poultry farms are probably the most free from this severe chick disease and are well able to provide high quality in all other desirable factors.

Selecting the Breed

Some breeds are more popular in certain localities than in others. White Leghorns are very popular in New Jersey, but New Hampshires are the predominant breed in New Hampshire. New England markets favor brown-shelled eggs while the New Jersey and New York markets have favored white-shelled eggs. There is no difference in quality, though shell color is different, but there is a decided consumer preference which has been built up over a

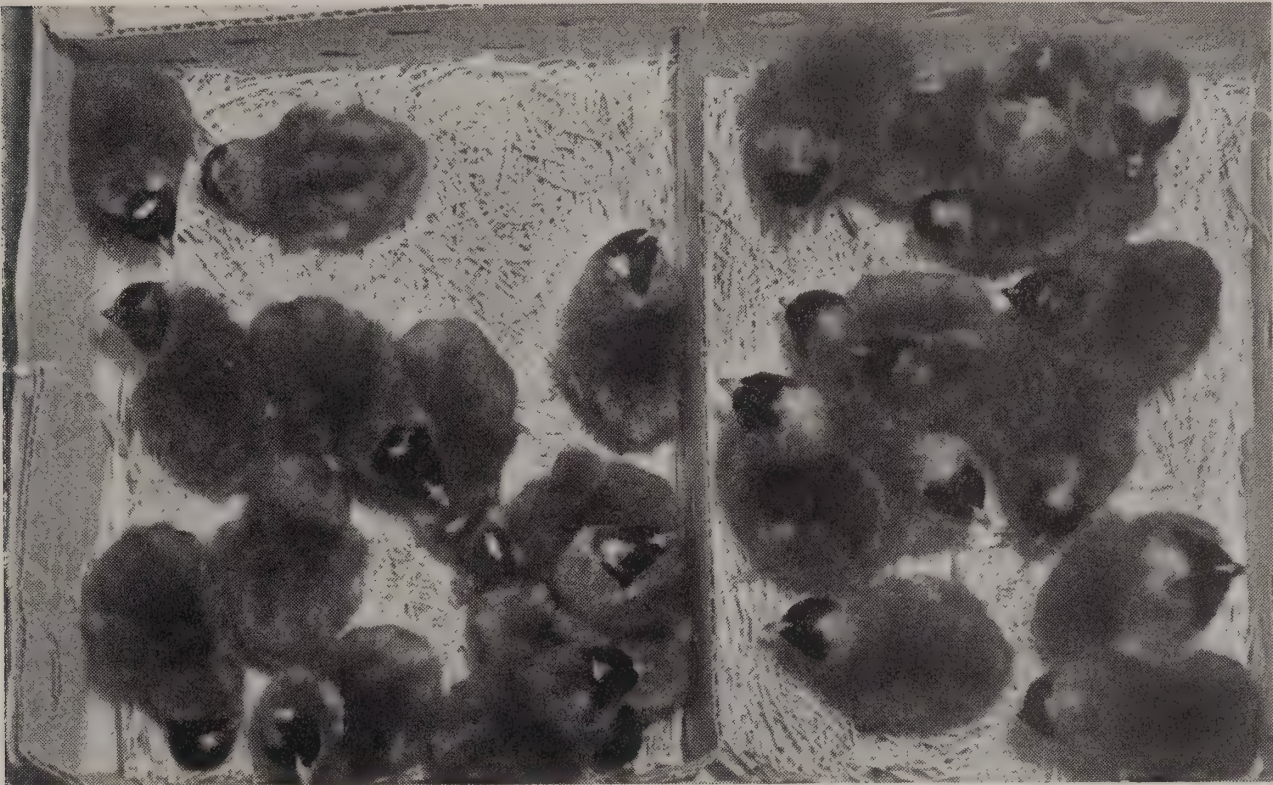
number of years. Hence, poultrymen select breeds laying the shell color preferred in their markets.

The breeds and varieties most common to the New England area are New Hampshires, Single Comb Rhode Island Reds, Barred and White Plymouth Rocks, and Single Comb White Leghorns. A considerable growth in the popularity of the cross-breeds has recently been evidenced. The most popular is that of New Hampshire or Rhode Island Red female with Barred Plymouth Rock male for broiler production. The reverse type of cross, producing the black pullet, is well recommended for market egg production.

When this latter type of cross is to be used, it is imperative that the New Hampshire or Rhode Island Red male birds used to sire the pens of Barred Plymouth Rock females be closely selected for fast feathering. These males which carry the recessive sex-linked fast-feathering factor are the ones to save



Selecting a newly hatched lot of Barred Plymouth Rock chicks at Peachblow Farm.



Visible evidence of sex-linkage by down color in purebred Barred Plymouth Rocks. Chicks at right are males, those at left are females.

and will be apparent at 10 days of age bearing tail feathers at least ¼-inch long. Such selection and use of male breeders can not only prevent poor feathering rate in black pullets, but also increase hatchability rate and even out the sex-ratio of chicks produced. The possible semi-lethal factor for nakedness can thus be largely eliminated.

Do not try to breed from cross-bred stock. The offspring will not be true in color, pattern, or action. Therefore, if you intend to reproduce stock, stay with the pure breeds.

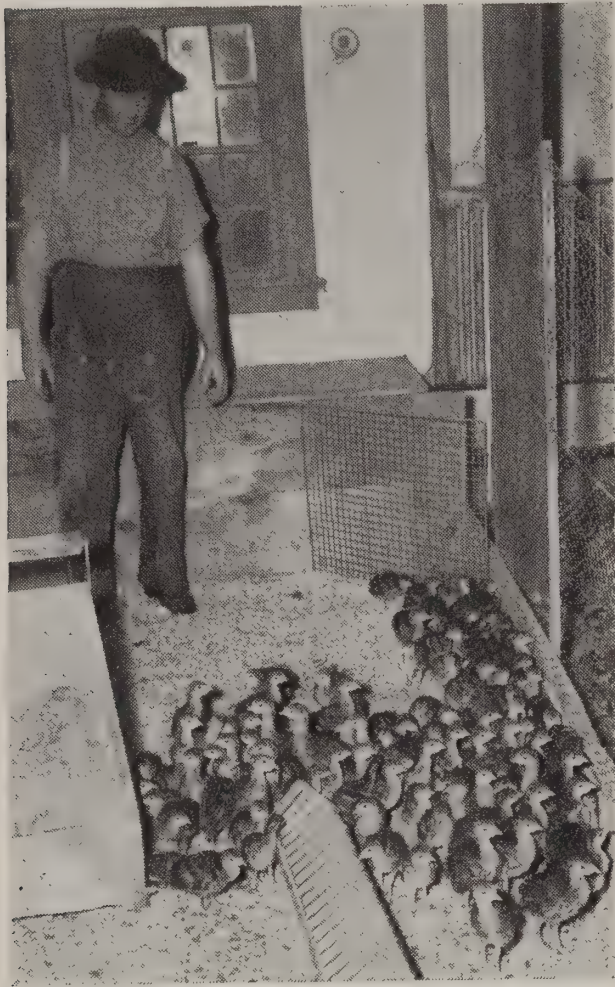
Sex Identification at Hatching Time

Poultrymen have shown considerable interest in the attempt to determine

PLUMAGE COLOR OF OFFSPRING WHEN MALE PARENT IS DOMINANT WHITE

<i>Plumage Color Factors Carried by Dominant White Male Parent</i>	<i>Plumage Color of Female Parent</i>	<i>Plumage Color Of Offspring</i>
1. Dominant white inhibitor	Red*	White with varying amounts of red
2. Dominant white inhibitor	Barred or Black	White with black ticking
3. Dominant white inhibitor, plus black	Red*	White with black ticking
4. Dominant white inhibitor, plus black	Barred or Black	White with black ticking
5. Dominant white inhibitor, plus silver	Red*	White
6. Dominant white inhibitor, plus silver	Barred or Black	White with black ticking
7. Columbian pattern (silver)	Red*	Columbian pattern
8. Columbian pattern (silver)	Barred or Black	Black and white

* New Hampshire and Rhode Island Reds; also buff breeds and varieties.



A nice group of young Bronze poults. Notice the electric brooder and wire corner guard.

the sex of chicks at hatching time. The chick buyers' desire to brood only pullet chicks rather than "straight-run" chicks have forced many hatcheries to employ the services of trained "sexors." These operators, making use of the so-called Japanese method of sex determination by physical handling, have become so proficient that hatcheries can guarantee up to 98 per cent accuracy in their selections. True, this service must be paid for, and when the demand for cockerel chicks is light, a higher price must be obtained for the pullets.

Advantages in brooding only pullets include less space and less total feed required as well as less fighting in broods. However, poultrymen who can handle the extra males point out that they serve as another source of income during the growing period when expenses are usually high. The sale of broilers at

12 weeks helps to offset the cost of rearing pullets.

Sex-linkage has been found to be useful in several types of crosses to produce sexdimorphism in down color of chicks at hatching time. Thus, in pure bred Barred Plymouth Rocks, males have a head spot tending to be diffused in color rather than clear white as in the female. Likewise, the outline of the spot in the male is more regular and circular than that in the female. Male chicks also carry uniform light colored shanks, whereas the female most often carries shank color of contrasting shades, dark and light.

Crossbreeding for sex identification has employed the sex-linked gene for barring as well as the sex-linked gene for silver color. The popular New Hampshire male — Barred Plymouth Rock female cross is an example of the first, whereas the New Hampshire Male (Gold) — White Wyandotte female (Silver) is an example of the second type cross. In the first, male chicks carry the white head spot, females none; in the second, male chicks are creamy white with females red or buff in color.

The Kansas State College has developed a strain of White Rocks that show sex-linked inheritance.

These birds are true for silver columbian pattern, being pure white themselves. When crossed with colored varieties the columbian pattern appears in the male offspring. When the silver columbian pattern is brought into the cross by way of these "silver" White Rocks all chicks will produce the columbian pattern.

Brooding Principles

Every poultryman's program for the brooding of chicks is influenced largely by certain practical and necessary principles of operation. They can be listed as follows:

1. Be prepared at least a day before the arrival of the day-old chicks. This implies:

- (a) Properly operating brooder.
 - (b) Temperature adjusted to 95° F. to 100° F. (For electric brooders use 105° F.) (See table on page 27.)
 - (c) Clean pen with clean litter.
 - (d) Adequate supply of feed and water.
 - (e) Chick guard in place.
 - (f) Newspapers covering litter for first three days is often preferred but not necessarily recommended.
 - (g) Mash or chick grains scattered on paper or paper flats.
 - (h) Guard against fire—Place metal sheet under fuel burning brooders.
 - (i) Proper space allowance—½ sq. ft. floor space per chick.
 - (j) Brood unit not to exceed 350 chicks.
2. Type of brooder makes little difference, the important factor is proper care and operation of the brooder in use.
 3. Frequent visits to brooder pens to check on (presence or absence of) proper conditions.
 4. Start at least 25 straight-run chicks for each lot of 10 mature pullets to be housed.
 5. Each mature bird produced will require about 30 to 35 pounds of feed. Make proper arrangements for the feed supply.
 6. Be careful in your attention to details, prevent chilling, overheating, crowding, and huddling. The first 2 weeks are most critical.
 7. Where infrared lamps are used, allow 250 watt bulb per 50-75 chicks.
 8. Where more than one lamp is used arrange in pairs angled at about 45° from socket.

Ten Management Recommendations for Chicks and Broilers

These management recommendations for chicks and broilers were adopted by the Nutrition Council of the American Feed Manufacturers Association, May 7, 1952. They represent one phase of the Nutrition Council's long range program designed to bring unity into the issuance of management recommendations for all classes of livestock and poultry. These recommendations are

the result of an intensive study of all available research. They are based upon the carefully considered judgment of the Nutrition Council and the recommendations of the nation's land grant colleges and experiment stations.

Brooding Space

1. Each chick should be allowed a minimum of 7 sq. in. of brooder space under the hover. For electric brooders, up to 10 sq. in. per chick may be needed.
2. Where chicks are brooded under individual brooder stoves or units, allow a maximum of: 350 replacement chicks per brooder unit; 500 broiler chicks per unit.
3. For chicks reared in confinement, allow a minimum of ½ sq. ft. of brooder room floor space per bird through six weeks, and a minimum of 1 sq. ft. per bird from 7 through 12 weeks.

Feeding and Drinking Equipment

4. Allow chicks the following feeder space:
 - Day old through 2 weeks — 100 linear inches* per 100 chicks.
 - 3 weeks through 6 weeks — 175 linear inches* per 100 chicks.
 - 7 weeks through 12 weeks — 300 linear inches* per 100 chicks.
 Additional space should be provided in warm weather.
5. Provide 100 chicks the following drinking space:
 - Day old through 2 weeks — 20 linear inches**, or two 1-gal. fountains.
 - 3 weeks through 12 weeks — 40 linear inches**, or two 3-gal. fountains.
 Additional space should be provided in warm weather.

* For example, a 4-ft. hopper open to birds from both sides provides 96 linear inches of feeding space.

** For example, a 4-ft. water trough open to birds from both sides provides 96 linear inches of drinking space.

Management

6. In cold weather, use a solid chick guard around the hover to keep chicks from straying and to prevent floor drafts. In warm weather, a wire guard may be used.
7. Place the guard 2 or 3 ft. from edge of hover. Gradually expand it and remove at end of 1 week.
8. If roosts are to be used later for hens, provide them for the replacement chicks at 4 weeks of age. Allow 4 in. roosting space per chick. If roosts are not to be used for hens, do not use them for replacement chicks. Do not use roosts for broilers.
9. Provide at least 2 in. of suitable litter at the start. Cane pulp, shavings, sawdust, crushed corn cobs, chopped straw, peanut hulls, peat moss, sand and others may be used when free from injurious materials and reasonably free from dust. If litter is used for more than one brood of chicks, litter immediately under the brooder area should be entirely replaced for each brood. Remove all caked and damp material, resurface with $\frac{1}{2}$ to 1 in. of fresh litter. Stir and add fresh litter as needed.
10. Use all night lights equivalent to 15 watts per 200 sq. ft. of floor space. This helps prevent pile-ups.

Litter Comparison

We are often asked to discuss relative merits of various types of litters and to suggest the one best. There is no one best litter under all conditions, but perhaps the accompanying table may offer some comparative information of value.

AVERAGE FLOOR COVERAGE OF LITTERS

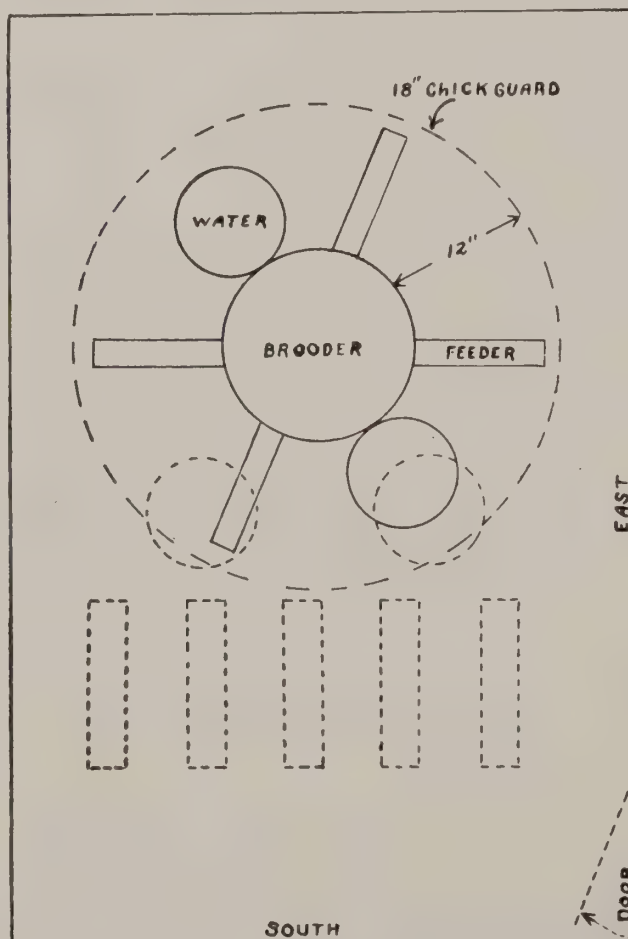
Litter Type	Pounds Needed for 100 sq. ft.			Ave. lbs. Per Bale
	1" deep	2" deep	3" deep	
Servall	31	62	93	90
Peat Moss	37	75	112	135
Shavings	47	94	141	65
Merrimack				
Wood Fluff	32	70	95	70

Types of Brooders

Many different types and kinds of brooder stoves are available to the poultry raiser. It makes little difference which kind is used. The major consideration is that any stove, properly operated, will do a satisfactory job. A brooder designed for care of 100 chicks will not properly care for 300.

The coal brooder has been accepted and is used by more poultrymen than any other type. However, wood, oil, electric, gas, and hot water brooders have all found their places and give good performance.

The old argument that auxiliary heat is necessary for use with electric brooders has been disproved. This brooder will perform better without auxiliary heat. Remember, it, as well as the gas brooder, is a cool room operator. Under the brooder, conditions



Ideal brooder equipment arrangement within the brood area. Dotted lines indicate changed arrangement of feeders and waterers upon the removal of the chick guard. Feeders are arranged for efficiency in chore route.

are perfect for the chicks. The room itself may be zero or below in temperature and be uncomfortable for the attendant, but the chicks themselves will not worry when the brooder is properly operated.

Wood and oil burning brooders must be frequently cleaned to prevent accumulation of creosote, carbon, or dirt. The attentive caretaker will regularly care for this chore.

Hot water brooders are more particularly designed for use in large brooder houses with a series of adjacent brood pens under one roof. Oil or coal serves as fuel for the central boiler from which the hot water is piped to the several brood pens. These can be thermostatically controlled and will operate in good order when the radiation area is balanced to size of the boiler.

Radiation required for hot water brooding is approximately 3 square feet per linear foot of house. Thus, a 20' x 100' house will require 300 feet of radiation. Six pipes 1½" inside diameter will provide 3 square feet of radiation per linear foot under brooders. For natural flow a 4" rise per 100 feet is required. With circulator pump pipes may be kept level. Boiler radiation should preferably run 75 to 100 per cent greater than pipe radiation.

Many variables must be considered in any discussion of brooder temperatures. No one answer alone can be right under all conditions. In answer to requests, however, please note the table below to indicate optimum brooder

temperatures up to and including the period of 8 weeks of age.

The table applies during the cold weather period. Should you disagree, we welcome your constructive criticism.

Brood Shelters

Brooder houses are naturally of variable design, from a spare room in the house or barn to a modern and costly structure. For the commercial poultryman either the colony house or permanent long brooder house system is used. Each of these two systems have their particular advantages.

The long, permanent brooder house is always in one spot; it cannot be moved to clean land each season. All work is confined under one roof and probably less labor is involved for its care. The chore route is shorter than when colony houses are used. Disease outbreaks are likely to spread more rapidly in the permanent brooder houses. Continuous use of the same range land is not advisable; hence, colony houses which can be moved to new grass land are many times preferred. When birds from permanent house are put on clean range, range shelters must be provided. Colony houses can serve as range shelters as well as brooder houses.

The size of each pen, whether colony or permanent type, should not be less than 10' x 12' in floor area. Small units are difficult to operate for equipment overcrowds the floor area.

Type of Brooding	AGE OF CHICKS IN WEEKS							
	up to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8
	Suggested Temperatures in Degrees Fahrenheit							
Coal, Wood, or Oil Brooders	95	95	88	85	80	75	70	70
Electric or Gas Brooders	105	105	100	95	90	85	80	or less
Hot Water Pipes Above Chicks	95	95	88	85	80	75	70	for
Hot Water Pipes Below Chicks	90	85	80	80	75	75	70	all types of brooding

These temperatures apply at a level of about 2 inches from the surface of litter. Litter under electric or gas brooders should be at least 2 inches deep.



A home-made type electric brooder properly arranged for these contented baby chicks. Notice the shavings on top of brooder as an insulation layer.

Other Equipment

Feeders, waterers, and chick guards have been mentioned; but in addition to these three major pieces, others may be desirable. Frequently recommended is the placing of feeders and waterers on raised wire platforms. This improves general sanitation within the pen. Such platforms can be constructed using 1" x 3" boards to form a rectangle or square to extend 5" or 6" beyond all sides of the waterer or feeder to be supported. Use such boards on edge to make a 3" high platform and cover with 1" mesh hardware cloth or 1" x 2" mesh welded wire. Do not use the light 20-gauge wire for it will soon break through.

Training chicks to roost is essential when raising replacement stock. A

framework of 1" x 2" boards laid flat on a support 4 inches off floor will suffice until birds are ranged. This framework should be placed within each brood pen when chicks are about four weeks of age.

Each brood unit should be fitted with a 5 or 7½ watt attraction light where electricity is available. These lights aid in prevention of crowding or piling up. Placed just above the brooder stove, the lights serve to teach chicks the location of heat source.

Litter is a controversial subject for discussion, but nevertheless must be provided for all poultry operations. Sand, gravel, Merrimack Wood Fluff, shavings, sawdust, peat moss, sugar cane, and others are used satisfactorily. The main point to remember is to keep

litter dry. Built-up, deep litter with good house ventilation is most acceptable. Deep litter in a poorly ventilated house is poor economy. (See page 26.)

When brooding with electric or gas brooders, start with an extra deep litter to provide greater insulation value. With other brooders, start with a light layer, gradually adding additional litter and rake it over frequently to make a built-up litter.

Two clever schemes to prevent chicks from crowding in the corners have been observed. The first is to string a few wires across corners connected to an electric fence controller. Parallel these with ground wire. Chicks will not press against such wires and into the corner more than once.

The second suggestion is to build out of 1" x 2" lumber a triangular frame with sides two feet long. Cover with wire and tack in place in all corners. Birds crushed against wire still have a chance to breathe.

Merrimack All Mash Feeding Directions

(A Complete Breeder Ration)

For Chicks, Layers, and Breeders:

First Week—Merrimack All Mash and warm water, in clean hoppers and waterers, should be ready for the chicks upon arrival. Water with the chill removed may increase intake by 20 per cent. Paper plates or egg cup flats may be used if preferred. Add regular chick feeders on the third day, but continue plates for one more day. Add hopper of chick size grit after 10 days of age. Allow 1 inch of feed hopper space for each chick. Chick feed (grain) is often used as the sole feed for the first 2 days.

Second and Third Weeks—Continue as outlined, keeping dishes and hoppers clean and full all of the time.

Fourth Week—Double the hopper space. Make sure litter is clean and dry, if not, replenish.

Fifth and Sixth Weeks—Separate the sexes if possible. Continue as out-

lined. See Chick and Broiler Management Recommendations (page 25).

Eighth to Twelfth Weeks—Sell broilers. Continue pullets as outlined.

Twelfth Week to Sixteenth Week—Continue as before. House pullets about the time they come into production.

Laying Birds—Keep Merrimack All Mash, fresh, clean water, oyster shells, and grit or calcite grit before the birds all the time. Allow at least 32 feet of feeding space per 100 birds. No supplementary feeds are needed with Merrimack All Mash. All Mash Pellets may be used during the fall and winter season to the extent of 8 pounds per 100 layers daily. *Do not feed hard grains.*

Merrimack Fast-Gro Starter and Broiler Ration

(Soft, Pelleted, and Nibbles)

First Week—Have Merrimack Fast-Gro Starter and Broiler Ration and warm water before the chicks when they are put around the hover. On the third day, add Starter and Broiler Ration to regular hoppers, providing one inch of feeding space per chick. Chick Feed (see page 94) is often used as the sole feed for the first 2 days. Mash is added on the third day.

Second and Third Weeks—Keep Fast-Gro Starter and Broiler, water, and grit before chicks all the time.

Fourth and Fifth Weeks—Double hopper space. This is very important.

Sixth to Eighth Weeks—Change gradually to Merrimack Growing Mash. During the day feed about one quart of Merrimack Intermediate Chick Feed for each 100 chicks. Half of this amount should be given one hour before dark. Intermediate Chick Feed may be fed in the litter or fed in hopper.

Separate sexes at 4 to 6 weeks of age or sooner if possible.

Tenth to Twelfth Week—Change from Intermediate Chick Feed to Scratch Feed.

Twelfth to Sixteenth Week — Keep hoppers well supplied with Merrimack Growing Mash. Feed Scratch Feed morning and night.

There has been a definite switch by many poultrymen from the use of regular Growing Mash to that of Merrimack Growing Mash pellets during the range period. Savings in feed and labor are the reasons. This is recommended, but care should be exercised and the birds watched to prevent possible outbreak of cannibalism.

Housing — When pullets are housed, gradually change to Merrimack Laying Mash, keeping it before the birds all the time with grit, shells, and water. Feed Merrimack Scratch Feed at the rate of about 2 quarts per 100 birds in the morning and about 4 quarts at night. (See page 51.)

Merrimack Fast-Gro Starter and Broiler is a complete, high-energy broiler ration, available in mash or pellet form. Follow the accepted method of starting day-old chicks on this mash, using egg cup flats or low open feeders for the first 2 days. On the third day, use regular chick feeders and provide at least an inch of feeding space for each chick. Each unit of 100 chicks should have a 1-gallon water container. Make grit available at least by the second week to enable more efficient use of feed and to cut down possible waste.

At about the fifth week, feeding of Merrimack Fast-Gro Starter and Broiler pellets may begin. Increase the feeding space to 2 inches for each chick. Add pellets to the feed hoppers on top of Fast-Gro Starter and Broiler mash. Feed an amount that will be cleaned up in 15 to 20 minutes. A gradual increase may be made in the amount of pellets fed, and pellets may be fed exclusively after 2 weeks of use with mash.

Broilers should be fed this ration entirely from day-old age up to marketing



A group of high quality Barred Cross broilers about ready for market.

time. Most broiler raisers prefer this ration carrying the sulfaquinoxaline contents as noted on page 69.

NIBBLES

These are small (9/64" size) pellets useful in assisting improved early feed intake. They are available only in formulations of Fast-Gro Starter and Broiler, Merrimycin and Turkey Starter Mash.

Feeding Pullets

Merrimack Fast-Gro Starter and Broiler, mash or pellets, is well suited to pullet chicks. Results on New Hampshire poultry farms show that pullets may be fed this ration up to the age of 8 weeks. After that time, we recommend that the feed be changed either to Merrimack Growing, Hi-F Grower, Complete Growing, or All Mash. Merrimack Growing Mash is suggested for those who prefer a system of grain and mash feeding. Those who prefer a complete system of feeding should select either Merrimack Complete Grower, Hi-F Grower, or Merrimack All Mash.

A STANDARD FOR GROWTH AND FEED EFFICIENCY ON MERRIMACK FAST-GRO STARTER AND BROILER RATION

Age in Weeks	Weight Males	Weight Females	Lbs. of feed per lb. of gain
2	.32	.32	1.80
4	.79	.79	1.84
6	1.54	1.35	2.15
8	2.41	2.04	2.36
10	3.30	2.70	2.68
12	4.25	3.40	3.15

The above two rations are designed for use by day-old chicks. No hard grains should be used with these rations since they are fully complete in all requirements.

Grit Feeding

The use of a hard, insoluble grit for all types of poultry is to be recommended. While some feeders allow its use from day-old age to maturity, we believe that restriction during the very early age of the chick is desirable. The unrestricted use of grit during the first week of age can be detrimental.

We have seen such chicks consuming this fine grit and neglecting to eat enough starting mash. Intestines have been scoured and gizzards compacted with this early fed grit when the feeder has neglected to provide adequate feeding area and sufficient mash.

In order to offset this possible difficulty, it is suggested that grit not be fed until chicks are about 10 days of age. By this time, they are well started on mash and grit can cause no harm. Reports have been received where feed efficiency has been increased by 5 pounds of meat per 100 pounds of mash consumed. This is an exceptional value, but increased benefit will probably result.

When large quantities of heavy grains are fed, the grit size should be increased very rapidly to insure a thorough grinding job. Chickens at age 6 weeks should receive coarse size grit. Turkeys at age 3 weeks should receive coarse size grit, at age 6 weeks, turkey size grit.

Caponizing

In a rather brief but conclusive way we present on page 33 a pictorial study of the procedures involved in the operation known as caponizing. A capon is an unsexed male bird and for market purposes must weigh over 4 pounds. These birds are usually marketed at from 6 to 10 months of age presenting soft and tender flesh of very good quality.

It is not uncommon during the operation that complete removal of the glands is not performed. As a result

LEADING COMMERCIAL BROILER PRODUCING STATES — 1952*

Georgia	\$88,610,000
Arkansas	57,346,000
Delaware	56,990,000
Maryland	49,800,000
Texas	49,356,000
Virginia	43,957,000
North Carolina	34,485,000
Indiana	32,112,000
Mississippi	23,663,000
Maine	23,647,000

* U. S. D. A.

the bird is considered a "slip" and maintains its male characteristics. Very few operators perform 100 per cent.

Birds to be caponized are usually less than 6 weeks of age. They should be well starved for a period of 24 hours. Water only is given during the first half of this period. Equipment consists of a good set of caponizing instruments including a knife, hook and probe, spreader, remover, and tie cords. In addition, a pan for instrument disinfection is advisable. Any standard disinfectant for internal use will serve, but a consultation with your local veterinarian as to kinds, use, and instruments may be worth while.

Following the operation, birds should be given soft feeds only—no hard grains—for a period of 3 or 4 days. Watch for "wind-puffs" and puncture them as they appear. Pinch skin together and force a sharp instrument through both layers of skin, making two holes. Press accumulated air out of pocket. Allowing "wind-puffs" to go to extreme size may add to losses. Take care of them as they develop.

Comparative weight gains of cockerels and capons are similar up to 5 months. After this period the capon exceeds in growth and at market time should be well in advance of the cockerel.

Caponettes

Birds commonly known as caponettes are male birds which have been given a dosage of female hormone, usually diethyl stilbesterol. It is applied by means of a 12-15 milligram pellet implanted under the skin near the head.

This implanted female hormone goes to work immediately and overbalances the normal body production of male hormone causing the bird to assume partial female characteristics. The large comb and wattles of the male shrink in size, the fighting and fast action of the bird is reduced, and with it all the bird takes on a more tender flesh well laced with fat layers. The final flesh upon cooking is more juicy

and tender than that of the untreated male bird.

Thousands of such birds have been treated with full satisfaction and profit to the grower. Where "slips" from the caponizing operation are encountered, implantation of a caponette pellet will offset an otherwise possible low grade bird.

Growing Chicks

Generally, the growing period refers to that stage of life from approximately 8 weeks up to the start of egg production. Hence, birds during this period are largely on range land and without artificial heat. Naturally, certain out-of-season broods will require some heat when reaching this stage of maturity during the winter months. The general principles will apply to these as well as those brooded in the usual spring period.

At the age of 6 to 8 weeks, male chicks will evidence changes in the secondary sexual characters which enable the poultrymen to separate them from the females. The comb rapidly increases in size, and type of feathers on neck appear longer and more narrow in shape than those of the female chick. Usually males are somewhat larger in size than females.

When these characteristics are evident the sexes should be separated immediately. Better growth will result for both lots if this procedure is practiced. General growing conditions for both males and females will be similarly provided. Where the starting unit was placed at an optimum size of 350 this unit at 6 to 8 weeks is then reduced to 150 or 175 chicks. The reduction in size of unit should take place even though all sexed males or sexed pullets were in the original starting unit.

Shelters

When the colony house system of brooding is followed, chicks may be allowed to grass range directly from such houses. However, many will use specially constructed range shelters for this range growing period.



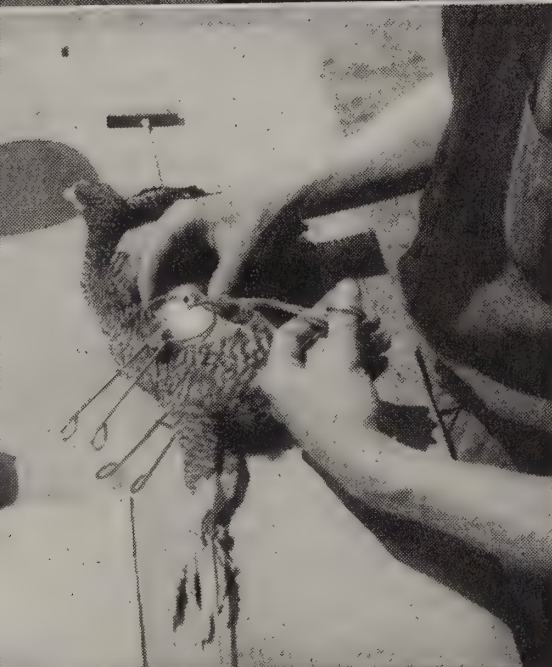
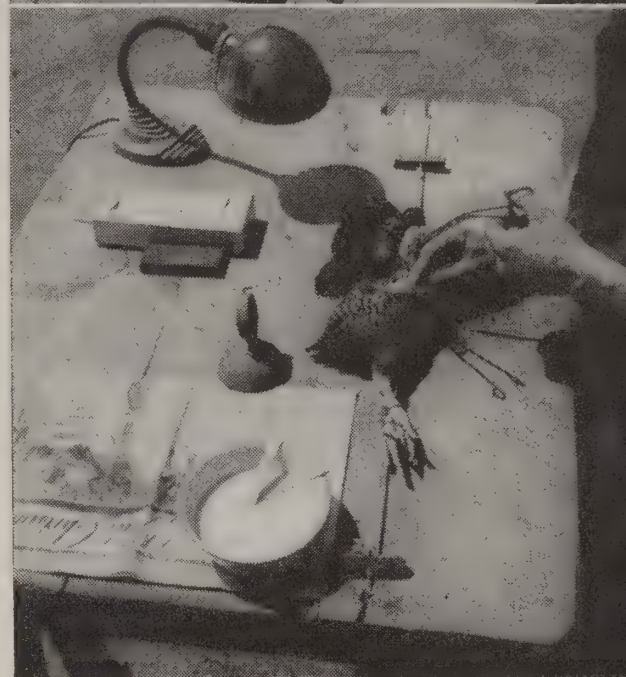
1. Layout of equipment used by a commercial caponizer includes lamp, sharpening stone, counter, disinfectant solution, rope holders with attached weights, removers, pick or probe, spreaders, and knife.



2. All tools in disinfectant solution, feathers removed over last few ribs, area disinfected with cotton swab, and incision being made between last two ribs. Skin is stretched forward previous to cut.



3 and 4. Two views showing spreaders in place to enlarge and hold opening into body cavity with removers about to be inserted.



5. Sex organ gripped by removers, cord has been carefully twisted and stretched ready for severing with knife.



6. Sex organ removed and spreaders being released.



7. Operation complete on one side. Bird will be turned over and operation repeated to remove second organ. Since skin was stretched previous to incision, the internal cut is covered by solid skin.



8. True cockerel held by operator on left with capon held by man on right. Notice absence of large comb and wattles on capon. Hackle and saddle feathers are more profuse on capon.

Note: This operation performed courtesy of G. Emerson, Hampstead.



A desirable shed-roof type range shelter, 6' x 10'.

Several types of shelters are used, but the actual construction details are not so important as is the fact that they *must* provide shelter and should be used *properly* on the grass range. In regard to their use, it is suggested they be placed about 80 ft. apart on the range. With a complement of about 100 birds per shelter, good distribution of birds over the range area will be secured. Overcrowding and creation of large bare areas will be prevented by this action. Make full use of range area. Don't enclose a small area and have acres of good green grass range outside the fenced area.

The photo above shows a small shed roof shelter which seems to be finding popularity on many farms. It is small, with room for 80 birds; it is easily handled, economical, and constructed with little difficulty.

The actual overall measurement of this shelter is 6 feet wide by 10 feet long. The base is constructed of 1" x 10" boards held together by corner studs of 2" x 4" stock and three floor joists made of 1" x 5" boards doubled. One joist is placed directly in the center from front to rear, and others spaced equidistant to ends of shelter.

The front height is 4' 6" from ground to roof, and the rear height 3' 6". The rear ventilation opening is a 1" x 12" x 10' hinged at bottom. Rafters are constructed of double 1" x 4" stock. Eaves extend 6 inches both front and rear. The roof is of heavy tar paper supported by poultry netting tacked to rafters. Cross ties between rafters are provided into which the



Range waterers manually controlled, placed on wire-covered frame over dry well. Cover of waterer removed.

overlapping edges of roofing paper is nailed. Six roost rails of 1" x 2" stock laid flat are provided over a 1" x 2" welded wire frame.

The user and builder of these shelters, Emery Wheeler, Canterbury, suggests that the front of the shelter be staked into the ground to prevent heavy winds from turning them over when they are not in use.

Equipment

Each shelter should be supplied with two or three 5-foot feeders with covers. One 5-gallon waterer or preferably one automatic float valve waterer connected to a running water supply is ample.

When birds are first placed in wire frame shelters early in the spring, it is well to cover three sides of the shelter with building paper or bags as an aid in maintaining warmth and protection from winds and storm. Birds placed on range after mid-June probably will not need this protection.

Many have found it advisable to make the transfer of birds to range in the afternoon. Confine the birds within shelter the first evening and the next morning open door and allow them to work their own way outside. Place one feeder and a small waterer inside the shelter the first evening, but bring them just outside the door in the morning. If one attempts to drive birds outside the shelter, the likelihood is that difficulty will be encountered in getting them back inside the next evening.

Every other day move feeders a few feet to prevent "spot" contamination. Keep them moving about range area and better cropping and utilization of the greens available will be assured.

Automatic watering devices are a material aid in providing convenience of operation and real saving of labor. A pipe or hose system (buried in a plow furrow) to which are attached automatic float valve waterers is ideal. Where a pipe system cannot be used, large barrels fitted with float valves

within an adjacent watering pan have been employed with good results. Wood barrels are preferred to metal ones since the water remains cooler. Each waterer, regardless of type, should be placed over a wire or slat frame above a dry well. A 3-foot hole filled with rocks or coarse gravel should suffice.

At the end of the season, investigate the possibility of using air pressure to blow water from buried range water pipes. It should prevent the accumulation of water pockets in low points of the pipe system and lessen damage from freezing.

Range Care

The ideal range is one having a well sodded cover of mixed, low growing grasses and legumes. The Merrimack Pasture Mix consisting of 6 pounds red top, 6 pounds of perennial rye grass, 2 pounds alsike, and 1 pound of ladino clover is an example of such a desirable mixture. Fresh, young greens of this type will be readily consumed, reduce total purchased feed requirement by 10 to 15 per cent, and provide very palatable, nutritious food.

Good drainage of an area to be used for poultry range is essential. Low, wet areas should be fenced off or tile drained if possible. Stagnant water in such areas builds up contamination and may be directly responsible for subsequent disease outbreaks.

One prime objection to an open field as a range area is that on a very hot or windy day, the birds refuse to range out properly. They do not like the wind nor the heat. It is, therefore, very desirable to provide some means of shade and windbreak. Strip cropping of the area with corn, sunflowers, or trees has been practiced. Artificial shade structures can easily be constructed from miscellaneous materials usually found on every farm. A lightly built, shed-roof frame covered with brush will serve the purpose.

It is well to remember that the nutritive value as well as the factor of



Bronze and U. S. D. A. Small White Turkeys at the U. N. H. Experimental Farm. Hinged wire catching frame in place.

palatability on all fresh greens is highest when in young growth. Keep the range mowed, if necessary. This automatically starts new side growth and thickens the sod. Don't hesitate to cut the grass over 8 inches in height. Tall grass will be matted down, create dampness, perhaps mold, and tend to stimulate trouble from coccidiosis.

A total of 500 to 700 birds per acre of range is optimum. This implies that they have good sodded grass range. This capacity may appear small but good management calls for it. There are always exceptions to the rule, however, and some poultrymen can so manage as to double this capacity. A little common sense in general care of range land will stand all of us in good stead.

At the time of moving birds to range shelters, if birds are 8 weeks of age or older, they may be vaccinated for fowl pox. This will save an extra handling if such a practice is followed. Further details concerning vaccination procedures are given under the disease section. (Page 64.)

Fox Control Methods

Many operators of range areas have and will probably continue to experi-

ence severe losses of growing birds unless sound measures are applied to offset possible losses from foxes or other wild animals. There seems to be no one guaranteed measure effective in all cases. These raiders are wily creatures and are very hard to combat.

We can assume no responsibility for the effectiveness of the suggested methods, nor for injury to persons or animals, which may unknowingly be harmed. Use strict caution in all measures, publicize by use of signs or other means to advertise possible dangers involved.

1. Spray a mixture of 20 parts by weight of crude furnace oil and 1 part gum spirits of turpentine to ground outside range area in a band about 3 or 4 feet wide. Repeat two or three times each season.
2. Use an electric fence at lower and top edge of fence line in conjunction with the usual poultry wire 5 or 6 feet in height.
3. Plow a deep furrow along fence line and bury the lower edge of fence.
4. Employ a well-trained watch dog and provide the dog with a long wire.
5. Hang mirrors or reflectors about the range area so direct sunlight will cause frequent flashes of light.
6. String a line of flashing 1 1/2-watt lights along the top of the fence line. Use a bulb every 50 feet or so.
7. Blast nearby fox dens.
8. Poison marauders by baiting with strychnine saturated, cull hens. (This is a very dangerous practice and not recommended although it has been used.)
9. Trap. Wash hands with soap, boil traps in water and pine boughs, wax traps with paraffin, wipe hands with pine boughs, pick up trap and place under light cover in a plowed furrow outside the range area.
10. Trap coons by using a No. 2 trap with the plate of trap wrapped in shiny aluminum foil. Be sure shiny side is out. Replace as it dulls.
11. Enjoy target practice . . . morning, night, and noon.

ELECTRIC FENCE INSTALLATION AND COSTS

(Estimated)

1. Use 2- or 4-point barbed wire for better penetration of fur.
2. Support wire 8" from fence and 6" above the ground.
3. Use sturdy posts . . . well placed.

- 4. Wire attached to post with Kwik Klips at insulator every 16½ feet to prevent sagging.
- 5. Use weed killer to reduce vegetative growth under and adjacent to wire. (3- to 4-foot path.)
- 6. Estimated cost per acre—1950:
 - a. Wire, 160 rods of 2-point barbed \$10.38
 - b. Posts, 160 @ .49 78.40
 - c. Insulators, 160 @ .025 4.00
 - d. Clips, 160 @ .005 .80
 - e. Gate hook, 1 @ .30 .30
 - f. Controller, 1 @ 16.50 16.50
 - g. Installation labor 10.00

\$120.38

Cost per bird (700 per acre) approximately 17 cents. Usable for several years.

Range Sanitation

To keep a sanitary range may mean the difference between success and failure in the poultry enterprise. Perhaps one of the most important points to consider is that of the use of lime. Lime is a deodorant and “sweetening” agent. It is *not* a disinfectant. It will tend to make the soil more alkaline and will favor, under certain conditions, plant growth. Many poultrymen believe that by spreading a layer of lime around a contaminated shelter or range area, they have disinfected the area and stopped the possibility of disease spread. This is far from the truth. (See page 64.)

The best procedure, if the area must be used again, is to remove the shelter

to a new location. Clean it thoroughly in its original spot before moving. Paint lower wood portions with a wood preservative such as Merrimack Red Mite Preventive or Carbolineum. Spray other exposed areas with a good cresol disinfectant such as Merrimack Coal Tar Disinfectant (4-Plus).

After shelter is removed to its new location, immediately clean up droppings about the old area. Cultivate this spot deeply and reseed to Merrimack Pasture Mix. (See page 35). Fence off the area temporarily until grass is well started.

Other sanitary principles imply frequent mowing, equipment kept in order, absence of trash or wastes on the range area, frequent moving of feeders, elimination of swampy areas, and thorough culling of sick or weak birds.

Treating Fence Posts

Natural untreated wood posts do not last as long as treated posts. Treatment with a 5 per cent solution of pentachlor phenol in light grade fuel oil as a diluent will increase life of post by 10 years or more.

Immerse (totally) all posts in this wood preservative solution for a period of 48 hours. Remove and allow to drain and dry before using.



Move the hoppers frequently. When feed hoppers aren't changed frequently, grass is soon worn away.

Feeding on the Range

Merrimack Growing Mash is compounded of highest quality, fresh, nutritious food elements. It is offered for sale under a guaranteed protein content of 17 per cent. In combination with Merrimack Scratch Grains which are composed of corn, wheat, oats, and barley it will provide good nutrition for all growing birds.

When birds are 6 to 8 weeks of age change them over from the starting ration to Merrimack Growing Mash. While it is usually suggested that a few days be allowed for a gradual change-over in feeds, at this period no setback will result from an immediate change. General feeding procedures should be continued with the allowance of at least two 5-foot long mash feeders available for each 100 pullets.

Birds at 10 weeks of age can be started on the regular Merrimack Scratch Grain while gradually reducing the use of Intermediate Scratch. Grain should be fed twice daily in an amount that will be cleaned up in about 15 to 20 minutes. Never feed so excessively that grain is allowed to remain in the litter or on the range ground. It is a sure way to throw the birds off feed. If some is left, skip the next grain feeding and then feed only half the usual amount. Gradually increase in subsequent feeding until the proper allotment is determined.

When feeding on range, scatter grain in a different area each time. When feeding in the house, put grain where litter is the deepest. Make sure there is an adequate supply of water and grit at all times. No extra calcium in the form of oyster shells, etc., need be used during the growing period.

Poultry Fitting Ration

Merrimack Poultry Fitting Ration, fortified with essential vitamins, is the feed to use when birds are "going off" feed intake or are in ill health because of some infection or digestive upset.

Ill birds and those in poor condition need a tempting food to make sure that they get all available nutritional benefit at the time it is most needed. Merrimack Poultry Fitting Ration is manufactured to fill this need. Into Poultry Fitting go generous amounts of essential vitamin carriers for extra fortification; fresh supplies of animal protein; bulk ingredients; and molasses for improved palatability.

Because Merrimack Poultry Fitting Ration tastes good, birds eat enough of it to help correct mild intestinal disturbances. We believe that this feed will prove helpful when birds have blue comb disease, ulcerative enteritis, or are in the recovery stage of coccidiosis. It may also be of use as a finishing diet for capons or turkeys in conjunction with the regular feed.

Vitamin and mineral values are properly balanced in Merrimack Poultry Fitting Ration. Protein content (expressed in percentage) is purposely held low, but includes several protein carriers to give a generous supply of different amino acids.

The protein content of this feed is held at a level which makes it usable as the sole feed for periods not exceeding three days. Longer use without other feed may result in wet pens.

A good method of feeding Merrimack Poultry Fitting Ration is to use it twice daily on top of the regular mash. Feed one large handful per 4-foot feeder. Just before and after noon is a good time to make this feeding.

In the event of a blue comb outbreak, make several smaller feedings each day, to stimulate appetite. Use Merrimack Poultry Fitting Ration together with the medicinal agents, such as copper sulphate, potassium dichromate, or muriate of potash in the drinking water. Supply extra waterers to provide plenty of water during the treatment. The feed alone will not control blue comb. It will help in control. (See page 93, No. 19.)

The twice-a-day feeding with regular mash is recommended when Merri-mack Poultry Fitting Ration is used to improve sluggish appetite. This treatment should be temporary and used only as occasion demands. One week to 10 days should suffice.

Estimating Cash Cost of Growing Chicks

Many estimates have been given relative to determining approximate costs of producing chicks to various ages. In each application of such formulas or estimates the grower should insert his own costs in so far as possible. To do so, he must maintain his own records. Only by so doing, can he be reasonably sure his final answer applies to his own conditions.

The following formula may be used as a guide, i.e., Chick cost + feed cost + fuel cost (2 to 3c) + litter cost

(1c) + mortality cost (aver. 6c) + labor cost (6c) = pullet cost at 5 months.

Delaying Maturity

In a recent release from the Purdue University, it is claimed that delaying maturity to increase the size of first eggs laid by a pullet merely costs the producer the number of small eggs that could have been laid earlier in life.

It is reported that eggs of late maturing birds would be the same size at that age as if they had started to lay earlier. They claim further that the age at which a pullet lays its first egg has no effect on the age when it begins to lay standard size eggs. Egg size will increase at a constant rate. Maturity age has no effect.

Pullets, they state, will have eggs differing by 0.32 ounces per dozen for each week difference in hatching date at any one time.

EXAMPLE OF ESTIMATING COSTS FOR N. H. CHICKS
STARTED IN FEBRUARY 1949

Period	Feed Consumed (Lbs. per bird)	All Mash (Cost per bag)	Accumulated Feed Cost (Dollars)
February 1-14	.28	\$3.84	\$.0107
February 15-28	.82	3.87	.0424
March 1-14	1.25	4.25	.0955
March 15-28	2.40	4.48	.2030
March 29 - April 11	2.75	4.54	.3278
April 12-25	3.50	4.39	.4814
April 26 - May 9	3.50	4.24	.6298
May 10-23	3.50	4.39	.7834
May 24 - June 6	3.50	4.60	.9444
June 7 - June 20	3.50	4.69	1.1085
	25 pounds		

Chick cost, 18 cents; feed cost, \$1.11; fuel cost, 3 cents; litter cost, 1 cent; mortality cost, 6 cents; labor costs, 6 cents = \$1.45 cash cost. Total cost should also include overhead, taxes, water, light, housing costs, and the like.

Care of the Laying Flock

All of the efforts which a poultryman expends previous to this period have been directed toward the production of a high grade sexually mature bird which will live and lay at an efficient rate throughout a normal laying season. The extreme care and attention given to the many details of operation must continue through this laying period.

Birds while on range have had considerable liberty in their movements. During the laying season they will be confined within houses and space per bird reduced to about 3 to 4 square feet. Under such a confinement program, good care must be provided for optimum returns.

Housing

The actual type or style of house to be used makes little difference except as it may influence care, ventilation, humidity, protection, and sanitation. These are important considerations, and as one type of house may more fully provide these desirable factors, that type of house becomes more popular.

Since one house is more economical to construct for the care of 1000 birds, than 10 100-bird houses, the simple factor of economy of construction becomes dominant. Likewise, 1000 birds in one

house are much easier to tend to than when spread in 10 houses. Labor saving devices fit themselves more readily to the larger, compact building than to small, scattered houses. The use of litter and feed carriers, running water, artificial lights, manure chutes, centrally located egg, feed, and equipment storage rooms all fit the single, larger house in a more efficient manner. The same argument may be carried into the desirability of one or multi-deck poultry houses. Large, more compact units are generally much more economical and efficient in operation.

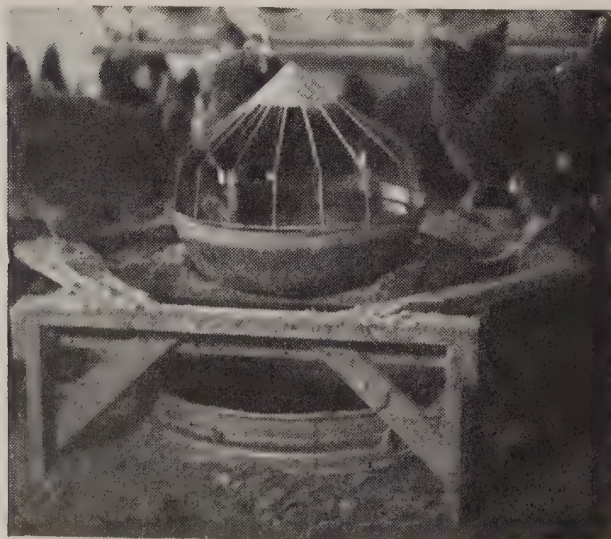
Types of houses are usually differentiated one from another by the kind of roof structure used. Thus, the shed, even gable, 2/3 span or uneven gable, monitor, and semi-monitor roofs are employed, but the type which seems most popular now is that of the shed roof.

Much is written concerning capacity of houses, suffice it to say that for brooding, about $\frac{1}{2}$ sq. ft. of floor area per chick is desirable at 1 day of age. At 6 weeks of age this area should be doubled, while for laying birds about 3 to 4 sq. ft. of floor space per bird is the common rule.

Optimum sized units of laying birds have been suggested at 150 to 200 layers per pen. Where flock matings are being secured and trap nests employed, 100 birds per pen is better. For individual male pedigree pen matings, 10 to 15 layers are sufficient. Recent construction and use of extremely large pens up to 4000 bird capacity has proven successful on many farms. However, study the possible problems created before proceeding.

Miscellaneous Housing Facts*

In the southern part of the United States, poultry laying houses should face east or southeast to exclude the hot



An ideal waterer arrangement for any laying pen. Note high stand rail, low waterer and spillage catch basin below.

* Taken from "Poultry House Requirements" — a report by the Poultry Committee of the Rutgers University Farm Buildings Institute, May 1947.



Grid-type waterers over a wire platform for extra sanitation. The rod centered in top of grid helps to prevent birds from roosting at this point.

summer sun and to take advantage of the prevailing breeze. In the cooler areas, these houses should face south or southeast to make the greatest use of the winter sun.

In either one story or multiple story laying houses, the ground floor should be of concrete or similar material. Upper floors can be made of wood. Pitch floors toward the front, about 6 inches in 20 feet.

The interior walls and ceiling of the laying house should be painted a light shade.

Ceiling height of pens should be 86 inches in the working space.

Light color roofs to serve as heat reflectors are recommended.

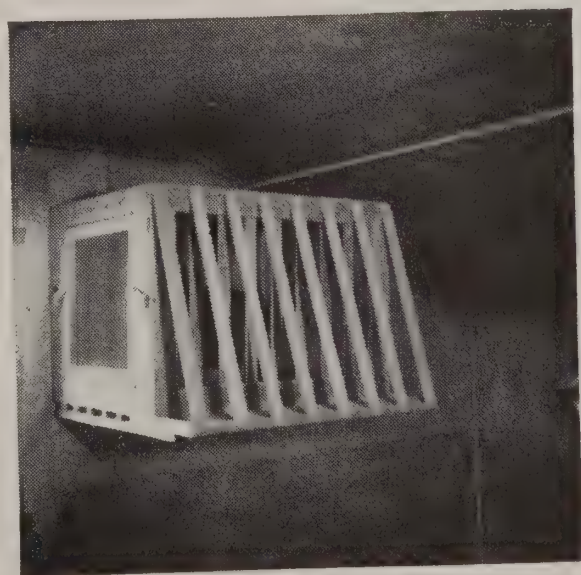
Entrance doors should be 3 feet wide by 6 feet 6 inches high and made to swing inward. Six-inch litter stops should be used under interior double swing doors. Removable panels in inner and outer doors supplanted by wire mesh openings are an aid in summer ventilation.

The window surface should be 5 to 15 per cent of the floor area with 75 per cent of window area located in the front wall.

Insulation of laying houses is recommended.

Allow 6 to 9 linear inches perch space for each fowl. (See page 42.)

Manure pits should have a minimum height of 12 inches in front and 18 inches in the rear.



A very suitable type of broody coop, made with wood-slat bottom. The channel under angular slats carries the water trough and feeder. The entire coop is suspended on a side wall over the droppings pit.

Equipment

The exact kind or type of equipment bears little relation to the actual performance of a group of birds, but enough feeders and waterers are essential.

Some 3 to 5 inches of feeding space should be available per bird housed. Thus, for a pen of 150 birds four 5-ft. feeders available to birds from both sides should be sufficient. Remember, that when using the All Mash method of feeding, the maximum rather than minimum number of feeders is desirable.

If stands or legs are desired for feeders or if they are suspended from the ceiling by ropes or wire, raise them from the floor to prevent idle birds from picking the back or vent of the feeding birds.

Whether feeders have a center reel or wire guard, many times desirable, they can well be fitted with a small baffle strip at the side edge to cut down feed waste.

Waterers may be of either gravity flow, open pan or pail, automatic flow, or continuous flow types. One 8-gallon gravity flow waterer is sufficient for a pen of 150 layers on the average day. Refilling may be necessary on warm days. The automatic float type is probably most desirable and popular. When running water for a continuous flow is available much otherwise necessary labor can be saved.

Each laying pen also will contain a suitable grit and shell box, one nest for each 5 laying birds, and about 6 to 9 inches of roost rail space per bird housed. Where box type nests are used, two 10-foot sections per pen of 150 birds is sufficient.

Although not essential, many pens are fitted with a broody coop. Slat or wire-bottom coops can easily be constructed in some convenient space to care for such birds. Broody birds should be fully fed and watered in order that they may return in proper condition for the production of eggs

as soon as the broody phase has been broken. Allow but one broody phase.

Space Requirements for Chickens

(Approved by the Nutrition Council, A. F. M. A., 1948.)

Feeding Space: A minimum of 32 linear feet of feed hopper space should be provided per 100 layers, i.e., four 4-foot feeders open to birds from both sides provides 32 feet.

Water Space: A minimum of one 8-gallon waterer or equivalent per 100 layers should be provided. When automatic float waterers or continuous jet waterers are used, one should be sufficient for 300 layers.

Roost Space: A minimum of 50 to 58 feet per 100 birds depending upon the size of bird. Heavy birds in warm climates may require 9 inches per bird.

Floor Space: A minimum of 300 to 400 square feet per 100 birds should be allowed when birds are in continuous confinement. This total space includes area covered by roosting pit.

Nest Space: A minimum of 20 individual box type nests should be allowed per 100 birds.

Superphosphate and Droppings

An average analysis of fresh poultry manure as voided will provide 26 pounds of nitrogen, 17 pounds of phosphoric acid, and 18 pounds of potash per ton. Superphosphate mixed with such manure does three things: Acts as a disinfectant and retards fermentation; combines with and stabilizes the nitrogen content (ammonia); and supplies phosphoric acid, thus helping to form a more complete and balanced plant food for field use. The application of 1 pound of superphosphate daily to the droppings of 100 birds is ideal. The presence of superphosphate in manure pits is a proven rat deterrent. To carry this re-enforcement of manure a bit further, one half pint of muriate

of potash may also be added daily to the droppings of 100 birds, thus building a highly fortified complete fertilizing material.

The Delaware Experiment Station has reported on the high use value of poultry manure for vegetable crops such as tomatoes, cantaloupes, watermelons, and lima beans. The manure is claimed to be most effective when broadcast over a winter cover crop that precedes planting of the crop. The recommended usage is 5 tons per acre.

House Ventilation and Humidity

Many of us often assume that when poultry house litter is wet and condensation is quite apparent within the house, ventilation is at fault. This may or may not be true. Ventilation, atmospheric humidity, heat inside and outside, birds housed, and insulation all have a bearing on the condition. To attempt to suggest a fool-proof method of ventilation applicable for all houses on every poultry farm is unwise. Each house has variable conditions which

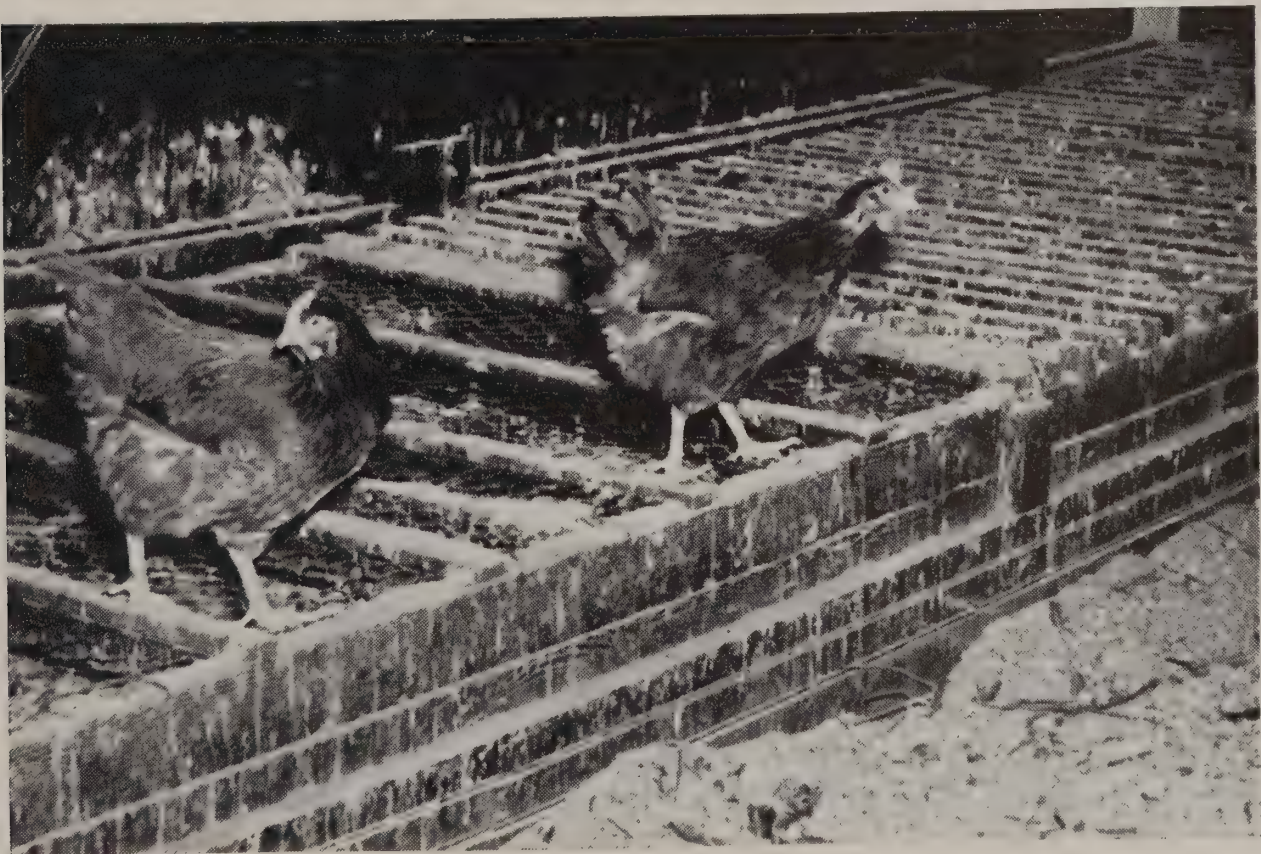
must be determined and then only certain remedial measures will be effective. Each case will probably be different.

To better understand this problem let us first think of humidity and what it means. If we fill a bottle with cold water in the summer and set it aside, in a short while drops of moisture are apparent on its sides. The air against the sides of the bottle is cooled by contact and will deposit some of its moisture, which was in the form of invisible vapor.

Experiments have shown that a cubic meter of *saturated air*, i.e., air which can hold no more moisture, contains at different temperatures variable amounts of water.

ABSOLUTE HUMIDITY AT SATURATION

Temperature		Grams of Water per Cubic Meter
°F.	°C.	
32	0	5
44	10	9
68	20	17
86	30	30
212	100	597



Two types of roost covering, 1½" mesh 16-gauge wire, and 1½" square wood slats laid 1½" apart.

From the table, page 43, it is noticed that saturated air at a given temperature can, at a higher temperature, take up more vapor before it is again saturated. Also, when air is cooled it must lose or deposit some of its water vapor.

The air about us usually is not saturated. If, however, the temperature suddenly drops, the same content of moisture may saturate this air. This point or temperature at which air becomes saturated and its moisture content condenses is termed the *dew point*. When the air is cooled below this dew point, vapor condenses, dew collects, or it rains. Hence, the terms "dry" and "moist" are purely relative one to another. When we read that relative humidity is 50 per cent we understand it to mean that it contains only half of the amount of water vapor it is capable of holding at the given temperature.

Relative humidity, temperature, and air movement all influence air condition. Proper air condition for humans has been stated to be 68° F., slow movement and a relative humidity of 40 per cent. This would be ideal in a laying pen.

Our only hope in practical poultry house management is to so govern the alterable factors to provide most nearly ideal conditions possible. These factors include.

1. Provision for air drainage.
2. Provision for windbreaks.
3. Temperature inside.
4. Air movement inside.
5. Provision for inlets.
6. Provision for outlets.
7. Insulation.
8. Type of ventilation system.
9. Bird capacity.
10. Protection from storm.

The most popular type of ventilation system is that of natural air flow. Outlets are provided just above the front plate and between rafters or floor joists which run front to back. Inlets are provided by sliding windows (up and down) so that amount of inlet opening can easily be controlled. The top of such sliding windows will reach

to the bottom of front plate. Slot inlets under window sills are often provided by double boarding under the window sill and allowing air to pass up this channel and enter the pen at sill height.

This treatment allows for fresh, cool air to enter at about mid-height of pen, circle gradually down to floor level toward the rear of the pen, and be warmed in its travel. This warming increases its moisture carrying capacity, and it picks up moisture, rises, and flows out of the pen at front plate openings.

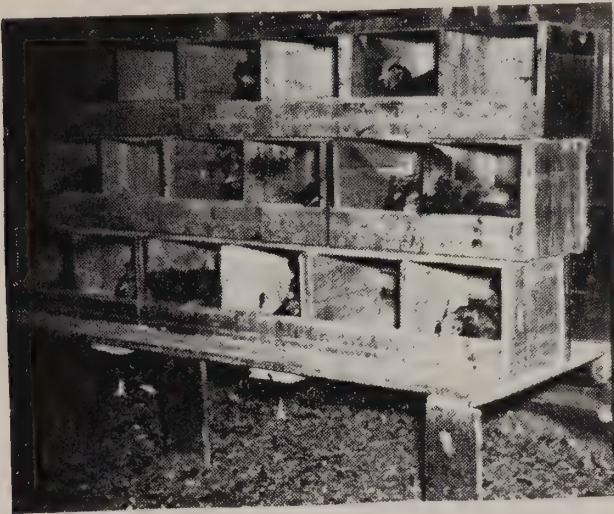
Forced Ventilation

Many poultrymen are investigating and using fans to provide forced ventilation or measured positive air flow in their poultry pens. While a great deal remains to be determined as to proper methods of use and installation, practical points of need are summed up in the following factors suggested by Professor Hoff of the New York State College of Agriculture:

1. The fan for any specific pen or floor must be selected on the basis of moving approximately $2/3$ of a cubic foot of air per minute for each square foot of floor area. Check your dealer on fan de-



Arrangement for a single sash sliding window between a double partition below, and a slot-type ventilator flue above the plate. Such a system has been of decided aid in solving ventilation problems.



An economical, easily assembled egg-case nest arrangement. Notice the step assembly.

livery. One fan per floor is sufficient unless the floor is divided into several pens by solid partitions.

2. Best location for the fan is in a wall near the ceiling, with a duct extending to within 15 inches of the floor. The area of the duct should be twice the area of the fan opening in the wall.
3. Definite fresh air intake openings must be provided. Each intake should have an opening area of 60 square inches and the openings should be well distributed around the outside walls, or provided by raising the lower sash of double-hung windows an inch or two and fastening a wide board to the window casing directly behind the opening to prevent a direct blast of air on the floor.
4. The house must not be overcrowded. Overcrowding produces more moisture than can be removed by a fan of the correct size for the house.
5. Drinking fountains must be of a type that prevents spillage of water into the litter. Litter made wet by spilling at the fountain cannot be dried out by a ventilation system.

Lime Aids Dryness

Dry litter within the hen house is something every poultryman strives for but with varying results. Influences upon this condition are multiple and while no one thing will guarantee dryness, the use of hydrated lime is helpful. Poor ventilation, it is true, will offset its beneficial effect on litter conditions. The use of hydrated lime mixed with the litter is not the final answer.

When dampness of litter seems inevitable, a correction of ventilation plus the use of 1 pound of hydrated lime for each mature bird housed will often help. Mix the lime well with the litter and stir frequently, perhaps every few days. The amount of subsequent additions will vary with conditions.

Litter-Dri, a very finely ground calcium carbonate, is strongly recommended for use in preference to the hydrated lime where the caustic action of the hydrate may cause injury to birds or skin irritation to the attendant. Use in the same manner as the hydrated lime but make sure a thorough mix with litter is obtained. The extreme fineness of grind of this product increases its moisture absorbing capacity.

Insulation

As mentioned previously, warm moisture-laden air will deposit its moisture when in contact with a cold surface. Thus, if the ceiling or roof of the laying pen is insulated with Merimack insulation board, the otherwise cold surface is kept warm. Being warm, condensation will not occur so frequently, and pens will be dryer in cold weather. Heat loss from the pen is reduced by about 40 per cent when the pen ceiling is insulated.

Referring to Bull. 338 from N. H. Agr. Exp. Sta. "Warming the floor of the poultry pen helps to maintain dry litter"—insulation keeps cold out and warmth in. "Uninsulated houses are damper than insulated houses with the same type of litter used."

In applying insulation board on new construction with "unfilled studding," first apply a waterproof building paper to the outside surface of the studs. Seal joints. Nail insulation board in place over the water vapor barrier and then follow with the usual external wood siding.

On old construction with "unfilled studding," it is often good judgment to apply a 1-inch by 1-inch wood strip in the corner against the stud and outside boarding to hold within this space

between studs the waterproof building paper and then insulation.

As noted above and especially on all "filled studding" insulation applications, it is necessary to nail a vapor-proof building paper over the inside of the studs *before* the inside sheathing is applied. This moisture barrier prevents entrance of water vapor into the filled insulation material which tends to reduce its insulation value.

The use of insulation board on 1-inch by 1-inch strips will provide very near the same insulation as that furnished by a 4-inch fill of shavings, and still leave no space for rats to work.

Wood fibre insulation board will be picked by birds and eventually ruined. It is well, therefore, to apply regular wood sheathing or asbestos board in place of insulating board from floor level or roost level upwards for about 18 inches.

Artificial Lights

A bird having the inherited ability to produce 150 eggs per year will not lay 200 eggs when placed under the influence of artificial lights. The application of lights to such birds will, however, stimulate production during that period of application. Properly applied from August to May, the stimulation will aid in the maintenance of high production during the period of higher egg prices.

LENGTH OF DAY *Concord Coordinates*

Longest — June 18 to 24 — 15 hrs. 24 min.
Shortest — December 19 to 25—8 hrs. 58 min.
Artificial Light Period — August 15 to April
28 — 13 hrs. 58 min.

Lights may be used to lengthen the day to a total of about 14 hours. They may be added only in the mornings, in both morning and evening, or solely in the evening period. It makes little actual difference.

The morning light period is preferred by many because it is: (1)

Simpler to operate, (2) less costly to install, and (3) does not lengthen the operator's working day. The lights are turned on at such time in the morning as to provide a period of light of 14 hours till dusk. They are, of course, turned off when sun is up and natural light is available.

A combination of an ordinary tumbler-switch and a common alarm clock can be fitted so as to do the work while the owner sleeps.

A more perfect, complete, and fool-proof system is the use of the automatic time-switch such as are available in all Merrimack stores.

In installing a light system, one 60-watt bulb is usually sufficient for 200 sq. ft. of floor area when suspended 6 feet from floor. Greater stimulation can be secured at times, when needed, by the use of higher wattage. Be sure the rays of light hit the roost section, otherwise some birds will be slow coming down.

Past experience has indicated that on a 1000-bird plant, one extra egg from each bird during this lighting period will pay for the cost of equipment needed.

Red Lights

Recent work reported from New Jersey indicates two things:

1. Exposure of laying birds to red lights will stimulate egg production.
2. Exposure to red lights was no better, as a stimulant, than exposure to white light.

However, for those interested, red bulbs of 10-watt rating, hung 18 inches above the perches and spaced 4 feet apart, may be used in place of the regular white lights. The time of lighting is from 4 to 8 hours direct exposure while birds are on roosts. Do not use lights of a higher wattage for birds will leave roosts and miss its stimulation. The birds on this test were fed on a mash and grain system. Doubt is expressed as to whether beneficial results will also occur on the all mash or complete system of feeding.

PRECAUTIONS

1. Practice regularity in operation.
2. Maintain body weight. Extra feedings may be required.
3. Have feed and water available when lights go on.
4. Fourteen hour day is maximum.
5. Lights will stimulate production. Collect eggs more frequently in cold weather.
6. When discontinuing lights do so gradually.
7. Use 3-wire circuit for installation with provision for use of electric water warmers to operate continuously in freezing weather,

Summer Shelters

Summer laying shelters are primarily designed to assist the poultry operator in maintaining bird capacity for his plant over a greater period of the year. They further enable one to bring pullets into the winter quarters at the proper time, and thus offset an otherwise possible fall molt or production set-back.

The birds which have been in the laying houses are moved out to the shelter during the period of May 15 to June 1. This leaves houses empty and able to be thoroughly cleaned and made ready for the early production

pullets. The older layers are made more comfortable and cool during such period when warm weather might otherwise cause them to stop laying.

Each shelter of a size 24' by 24' housing about 300 layers, with an acre of green pasture land about it, will enable these layers to continue their productive life late into the fall.

Two days previous to moving birds to laying shelters, feed extra on pellets or moist mash and continue for several days after moving. The use of Merri-mack Poultry Fitting Ration as noted on page 38 will conveniently assist in preventing a production upset. This assists in keeping up full feed intake which might otherwise be reduced. If feed intake reduces, production will also slump. Use strict care during and immediately after this moving period.

Culling the Non-Layers

By the term "culling" we refer to the segregation from the laying flock of those birds which are poor producers. Those removed as inefficient or poor producers for one cause or another are termed "culls." The procedure of



*U. N. H. 24' x 24' summer laying shelter.
Plans for this shelter are given on pages 86 and 87.*

culling is a constant or continuous job for all poultry operators. Be on the lookout for culls each day and remove them immediately.

Even though it is advisable to individually handle each bird in the flock every few months, still, daily removals can be made more easy and the job will never be large or bothersome.



Good feed deserves careful storage. Racks allow space for cats to work.

Good Producer	Character	Poor Producer
White, oval, moist	Vent	Yellow, small, dry
White	Eye Ring	Yellow
White	Beak	Yellow
White	Shanks	Yellow
Wide span, thin	Pubic Bones	Narrow span, thick
Large, full, bright red	Comb	Small, shrunk, dull
Bright, full	Eye	Dull, sunken
Broken, worn	Feathers	Full, glossy, new
No new feathers showing	Molt	New feathers present

To identify the layer in a healthy flock of birds merely look at the vent. It will be bleached, pinkish white in color, oval in shape, and moist. The non-layer will show a small, round, yellow, dry vent. Many other factors are used in the culling operation, as given in the accompanying table, but a little serious study and practice in handling birds will enable the novice to quickly master the principles involved.

Feeding the Layers

The fundamentals of proper nutrition for all layers involve the complete provision of the essential nutrients required by birds for the continuing manufacture of high quality eggs. Not only must adequate allowance be made for the carbohydrates, fat, protein, and fibre fractions of the diet, but these factors as well as minerals and vitamins must be provided in their proper proportions.

Merrimack Laying Mash for use in the grain-mash system of feeding and Merrimack Complete Laying Mash or Hi-F Layer for the complete system of feeding are accurately compounded

APPROXIMATE PROCESSING SHRINKAGE FOR VARIOUS KINDS AND CLASSES OF POULTRY

Kinds and Class	Approximate Shrinkage			
	Average Live Weight	Live to Dressed	Dressed to Ready to Cook	Live to Ready to Cook
	Pounds	Percent	Percent	Percent
All chickens	4.0	11.0	27.0	35.0
Broilers—fryers	3.0	13.0	29.0	38.0
Roasters	5.0	11.0	25.0	33.0
Leghorn hens	4.0	11.0	25.0	33.5
All turkeys	18.5	10.0	16.5	25.0
Ligh toms and hens	11.00	11.0	16.5	25.5
Heavy toms and hens	27.0	9.0	13.5	21.5

Figures in the table are based on data from various sources, including large-volume commercial operations and studies made under laboratory conditions. Utah Agricultural College.

with high quality ingredients only. They will provide optimum feeding value at very reasonable costs.

Allow adequate feeding space regardless of the system of feeding used. Generally, where two or three 5-foot feeders per 100 layers are used on the grain-mash system, on the Merrimack All Mash, Complete Layer or Hi-F Layer system, double this amount of feeding space is not too much. (See page 42.)

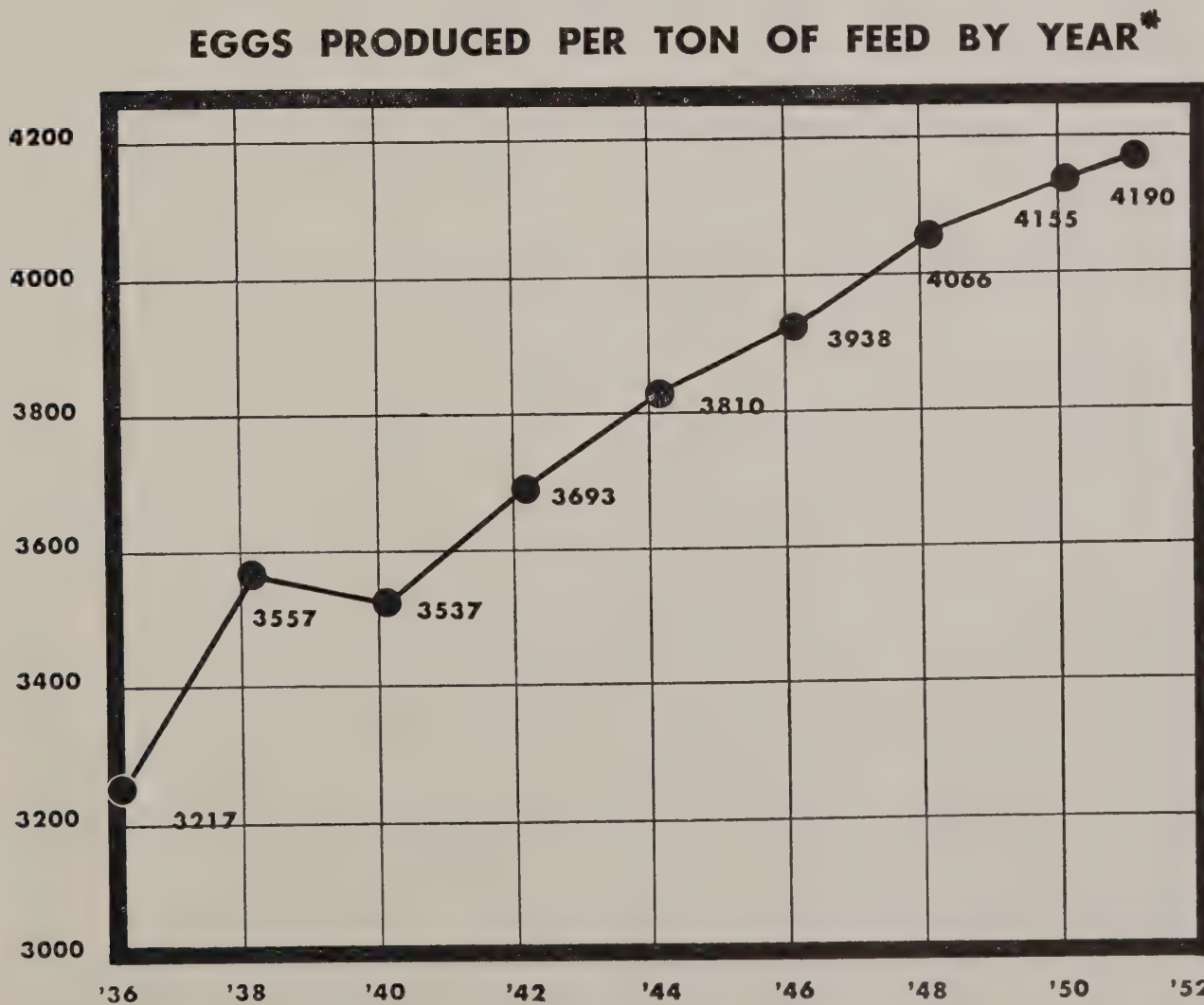
Regardless of the system of feeding selected, oyster shells and grit or calcite crystals, which provide both the calcium and grinding functions, should be made available. The reason for the use of grit is to enable the bird to better grind its food, thus making for more efficient utilization of the feed intake. Oyster shells or calcite grit provide the extra calcium required for the manufacture of sound egg shells. The greater the rate of production the greater is the need for calcium. Sup-

plementary products such as calcite crystals and Limeroll are often used to substitute for shells or for both shells and grit.

Use caution in feeding laying birds. Don't overfeed but provide continuing small amounts daily. Allow hoppers to be cleaned of feed at least every other day. Much better condition and production of birds will be secured by fresh feed twice daily than when hoppers are filled to the top and allowed to carry for several days. Wastage of feed increases under the latter method and rapidly increases your costs. Never add more mash than two-thirds of the hopper's capacity.

Maintaining Feed Intake

One should not feed haphazardly. Know how much feed, in pounds, is being consumed daily. A quick review of these records will indicate the necessity for improved practices or use of stimulating feeds.





*Who said rats? There are ninety laying birds in this picture.
Can you count them?*

When feeding mash or pellets by measure, one may use an average figure of $1\frac{1}{3}$ pounds per quart of All Mash and $1\frac{3}{4}$ pounds per quart of All Mash pellets.

Such feeds as pellets, moist mash, condensed milk, Merrimack Poultry Fitting Ration, Merrimycin (Aureomycin containing feed), and succulent greens are all appetite stimulants when properly used. If feed consumption starts to recede, one or more of these stimulants should be used. Begin gradually and increase the total daily feeding to a maximum of what will be cleaned up in about 10 to 15 minutes. This total per 100 layers daily will be approximately 8 pounds of pellets, 4 pounds of dry mash moistened, or Merrimack Poultry Fitting Ration, 3 pounds condensed milk, and 5 pounds of succulent greens.

Merrimycin, the high level aureomycin-containing mash or nibbles is specifically formulated for increasing feed intake in the presence of chronic respiratory disease (air sac infection). It can also be used according to recommended treatment for control of Blue Comb or non-specific enteritis. Use this

DAILY FEED REQUIRED PER 100
LAYERS FOR VARIOUS RATES OF
PRODUCTION*

Per Cent Production	Light Breeds	Heavy Breeds
20	20 pounds	28 pounds
40	22 pounds	30 pounds
60	25 pounds	33 pounds
70	27 pounds	35 pounds

* Based on data from N. Y. State Coll. of Agr.

mash as 100 per cent of the ration for 3 days continuously. When treating for disease continue its use for 4 more days diluted 1 to 3 parts of the regularly used mash.

Hard grain is used in combination with Merrimack Laying Mash, but NOT with Merrimack All Mash, Merrimack Complete Layer, Hi-F Layer or Merrimack Super Mash. While the rates of feeding grain will vary considerably, it is well to attempt a control of feed intake such as 60 per cent mash and 40 per cent of scratch. The table on page 51 may be used as a guide in your feeding program. It is only approximate. Changes may be necessary.

Pellets

Pellets are to be used as a supplementary feed replacing hard grains,

dry mash, or moist, fleshing and stimulating mashes. At the present time, all Merrimack poultry feeds are available or can be procured in pellet form except Poultry Fitting Ration.

Because pellets are hard and glazed on the surface they stay solid in the chicken's crop for a longer time. Eventually the moisture and secretions soften the pellets and, in so doing, the consumed pellets expand. Since this expansion takes place after the feed has been eaten, a greater actual consumption can be obtained, serving to maintain full feeding, good production, better growth, faster reconditioning of body weight maintenance, and good health of birds.

Start using pellets when an increase in feed consumption is desirable. Feed at the rate of 2 or 4 pounds per 100 birds daily at the start. Gradually increase this amount until birds are receiving about 8 pounds daily. It is generally best to feed pellets late in the afternoon just previous to roosting when using the All Mash system or at noon when using the Grain-Mash system.

Excerpts from Poultry Feeding in Britain (1943)

ALAN THOMPSON

The ration of meal allowed a pullet over 2 months of age in a domestic

flock is 5 pounds a month. This, reduced to simple terms by the Domestic Poultry Keepers' Council suggests the following daily ration for a layer:—

Just under 3 oz. Balancer Meal (1 teacup), 5-6 oz. minced house scraps or municipal pudding (a crammed ½ pt. glass), mixed together and given at two feeds, the largest one hour before sunset. Water ad lib., fresh green food, hard grit or gravel, cockle shell (or limestone grit).

Balancer Meal: — 20% protein, 9% fibre:—

Wheat by products and damaged flour — 30-40%; dried town meal 15% (garbage); fish or meat meal 10-12%; oil cake 5-10%; cereals and dried potatoes 20-35%; oats 15-20%; dried grains, yeast and grass 15%; protein oil seed cakes 5-10%; malt culms and sugar beet pulp 5-7½%; feeding bone flour 1%; calcium carbonate 3-4½%. Above formula allows for variables in composition.

Municipal Pudding — swill from cities:—

75% pudding; 17% balancer meal; 2% chalk; 6% grass. Makes very satisfactory laying ration.

We thought the above might be of interest to local poultrymen as a comparison of their own position when

DAILY HARD GRAIN FEEDING GUIDE

Pounds per 100 Layers

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Light Breeds	12	12	10	10	10	8	8	8	8	10	12	12
Heavy Breeds	14	12	12	11	10	10	10	10	10	12	14	14

WATER CONSUMPTION DAILY PER 100 S. C. WHITE LEGHORNS*

Month	Quarts Consumed	Month	Quarts Consumed
January	13	July	20
February	15	August	16
March	17	September	14
April	19	October	13
May	20	November	11
June	22	December	11

Total water consumed per year per 100 191 quarts

* Adapted from "Poultry Feeding" by G. F. Heuser.

LEGHORNS vs. HEAVIES — THE BALANCE SHEET

Advantages:

- (1) Less feed to grow a pullet — about 5 pounds.
- (2) Less feed in the laying house — about ½ pound per dozen eggs, or 10 pounds per year *at the same rate of egg production.*

Disadvantages:

- (1) Leghorn pullet chicks of top breeding will cost about 5 cents more than heavies of similar quality.
- (2) Leghorn fowl brings about 5 cents a pound less.
- (3) Leghorns at market will weigh about 1½ pounds less than heavies.

If you accept these assumptions, it becomes a simple matter to work out a balance sheet in terms of dollars and cents. This we have done using last year's actual prices for feed (5 cents a pound) and fowl (17 cents Leghorns, 22 cents heavies).

Advantages:

1. Saving in feed to grow pullets 5 lbs. at 5 cents equals	\$.25
2. Saving in feed in laying house 10 lbs. at 5 cents equals	.50
Total	<u>\$.75</u>

Disadvantages:

1. Extra price of pullet chick	\$.05
2. Loss in price fowl 4.9 lbs. at 5 cents	.24
3. Difference in weight 1.5 lb. at 22 cents equals	.33
Total	<u>\$.62</u>

Difference in favor of Leghorns equals 13 cents per bird.

Merrimack was offering "Makeshift Mash."

While we are on the subject of the laying flock we present herewith information released by the Extension Service of the University of Maine regarding Leghorns vs. Heavies and an assumed balance sheet.

Should We Shift?

Certainly Leghorns on the basis of the evidence deserve consideration here in Maine. But, the possible advantage does not appear to be anything like the enthusiasts have pictured. We must consider also the possibility that the low fowl price situation of the past few years might change. A rise in fowl price of 2 cents a pound would offset the above theoretical advantage of Leghorns.

There are other reasons why an immediate and general shift to Leghorns might be inadvisable. There is the

question of finding good stock. Very few Leghorns are available from New England breeders. We would have to go outside the area for much of our requirement, and this brings problems of locating the good stock, problems of shipping, and perhaps some dangers from disease.

Also, Leghorns require a little different handling and management. These differences are not great, but some poultrymen whose experience is with heavies might experience difficulty.

Again, there is the question of markets. As indicated, the reception of white eggs is encouraging, but we do not know just how fast this acceptance can be built up.

The decision on Leghorns is up to the individual producer. We have tried to present the facts fairly. The reader will no doubt be able to think of additional angles which we have not covered.

Management of the Breeding Flock

Much of which has already been discussed will apply equally as well to the breeding as to the laying flock. The prime difference is in the quality, both physical and productive, of the birds contained. A good layer is not necessarily a good breeder, but a good breeding female must always be a good layer. The market egg producing flock has no need of male birds and they should not be kept. On the other hand, male birds have been estimated as one half the value of the breeding flock and, of course, are essential.

In the handling and care of market egg flocks, one must know and put into practice the best of culling procedures, whereas the operator of a breeding flock must in addition employ careful selection. Use of good selection principles for breeding flocks has, without doubt, been furthered by the establishment of the National Poultry Improvement Plan. This plan, uniform over the entire country, is a step in the right direction even though certain provisions are controversial.

Briefly, the Plan includes various advancing breeding stages termed U. S. Approved, U. S. Certified, U. S. Record of Performance, and U. S. Register of Merit. In addition all these stages are influenced by freedom from pullorum disease. The two classes used by New Hampshire and the other New England States are known as the U. S. Pullorum Passed and U. S. Pullorum Clean ratings. Further detailed information on the provisions of the Plan can be procured by writing to the Poultry Husbandry Department of your State College.

Since the Plan is now operative in 47 States, all hatching egg and baby chick producers of New England have found it not only advisable, but many times essential, that they participate.

Mating Procedure

It is generally conceded that when breeding hens are properly mated there

will be 5 or 6 active males per 100 Leghorn females (light breeds) or 7 to 8 active males per 100 New Hampshire females (heavy breeds). While it is true this ratio of males to females is not practiced 100 per cent by all operators, it has been found to be correct and satisfactory. Some breeders of the heavier breeds will use up to 10 males per 100 females. However, there usually is more fighting among these males and interrupted services than where the smaller number is used.

Dominant White and Pureline cockerels under average conditions, don't seem to have quite the same degree of sexual activity as some other breeds. Better figure on ten of them per 100 females. And plan your chick order accordingly — possibly 15 or 20 at the baby chick stage for each 100 females to be used later. As mentioned before, debeaking the females will minimize any tendency to pick the white feathers.

Every operator knows that he can expect some mortality among male birds, and for that reason, he could well maintain one or two extra units or groups of males which can be used as replacement breeders. When two birds are lost from the original complement of eight breeding males, the remaining six are removed entirely and a new complement of eight males are added. To add one new or foreign male to the established group remaining with the females would spell disaster for the added male. Considerable fighting would result and, unless the social status of the males was changed after the fight, the new male would never be of any value.

Rapid Feathering

All poultrymen want chicks which they are raising to produce reasonably even and rapid feather development. While this characteristic is not too important for replacement layers in themselves, it is very important when such birds serve as parents of chicks for the broiler market. Thus, breeders

should select flocks on the basis of rapid feathering.

Realizing that the character of slow feathering is dominant to rapid feathering and that it is sex-linked, a rapid feathering sire mated to a slow feathering dam will produce slow feathering in the male chicks. Thus, mate only rapid feathering parents to produce rapid feathering offspring. Measure this early feathering character by the number of visible secondary feathers as seen from the underside of the wing at day old age. There should be about six present.

Hatching Eggs vs. Market Egg Production Costs

The following discussion centers around information which has been released by the Extension Service of the University of Maine and from the University of Massachusetts. More details on this subject can be procured direct from these sources.

From the standpoint of producing market eggs the Massachusetts Station reports that during the year of 1944, an estimated 51 per cent of total costs or 24.8 cents per dozen eggs produced was expended for feed; 22 per cent or 10.8 cents for labor and management; 20 per cent or 9.5 cents for overhead, and 7 per cent or 3.3 cents for supplies. They estimate a cost of 48.4 cents as the cost of producing one dozen eggs. This figure looks large and probably is under certain conditions, but feed price was assumed at \$3.44 per cwt; eggs produced at rate of 50 per cent; labor at \$4.40 daily; management cost at 30 cents per bird per year; overhead which includes interest on investment at 5 per cent, taxes, insurance, repairs, mortality, and depreciation cost was reasonably assumed, and supply cost at 50 cents per bird.

The University of Maine lists the following costs involved in the production of hatching eggs.

DIRECT COSTS

1. Cost of pullorum testing.
2. Cost of official breeding programs — Approval, etc.
3. Depreciation on males — cost of raising cockerels, less sale value at end of season for meat.
4. Cost of feeding males — 2 lbs. per bird per week.
5. Extra cost of feeding hens — cost of breeder ration over laying ration.

INDIRECT COSTS

1. Extra labor involved in breeding work, care of males, grading, and packing.
2. Reduction in house capacity due to presence of males in pen.
3. "Wear and tear" on hens resulting in higher mortality, more culls, lower egg production, and lower sale value of hens as meat.

They further state "the extra costs of producing hatching eggs over market eggs for the 1000 bird flock amount to approximately \$600 in the course of a year." This applies solely to the direct or measurable costs as listed above.

Factors Influencing Hatch

The major factors which might be listed as affecting hatchability of eggs are: (1) Inheritance, (2) incubation procedures followed, (3) care of eggs previous to and during incubation, and (4) condition of the breeding flock. Hatchability has definitely been proven to be influenced by inheritance of multiple factors. Certain individuals, regardless of care or feed given, will always produce low hatching quality eggs. These must be weeded out of the breeding flock by means of pedigree record keeping. Poor incubation, interruptions in heat supply, infrequent turning of eggs, improper moisture during the incubation period, among others, will definitely reduce hatchability. Eggs of extreme large or small size, double yolked eggs, chilled, cracked, or porous shelled eggs, eggs over 7 days of age, and eggs not turned during holding period will all tend to reduce hatchability. Breeders in poor physical condition, diseased, improperly housed, tend to produce low grade eggs resulting in poor hatchability.

In a study on the influence of egg shell color on hatchability, the Ohio Experiment Station has presented data as noted in the following table:

Breed	PER CENT HATCH		
	Color Light	Color Medium	Color Dark
New Hampshires	63.38	72.16	76.79
New Hampshires	61.19	78.55	77.25
White Rocks	73.81	77.50	80.53
White Rocks (R. O. P.)	71.70	79.28	
Barred Rocks	67.46	64.96	74.27

This would indicate a preference for medium to dark shell color on all hatching eggs.

It is quite true that cockerels will give 5 to 7 per cent higher hatchability under similar conditions than will cock birds. Further, immature cockerels or those under 6½ months of age should not be used to head breeding pens. Males should be mated with females at least 3 weeks previous to saving hatching eggs.

Maintaining Fertility

Any discussion on the maintenance of fertility must consider hatchability for both are intimately associated. The

following list should be carefully checked against your own operations as an aid in improving existing conditions.

- 1. Inherited high vitality in the breeding flock.
- 2. Adequate floor space per bird (3 to 4 sq. ft. per bird including males).
- 3. Use of completely balanced rations along with optimum feeding methods.
- 4. Adequately lighted breeding pens (feeders perpendicular to windows).
- 5. Sanitary pen conditions.
- 6. Freedom of birds from lice, mites, colds, or parasitic infestations.
- 7. Proper length of working day (14 hours light is sufficient).
- 8. Use of mature breeding males.
- 9. Proper number of males per 100 females.
- 10. Absence of frosted or frozen combs and wattles.
- 11. Normal size of males compared with females.
- 12. Proper use of males with periodic rest period.
- 13. Absence of fighting among males, hence uninterrupted service.
- 14. Tight doors between pens to prevent exchange of birds.
- 15. Sound body quality and condition of males.
- 16. Proper period of mating previous to saving of eggs (about 3 weeks).
- 17. Continuing high production in females.
- 18. Absence of complete or partial molt.



Watching the second hand on clock for proper immersion time in semi-scald tank. Time of immersion and water temperature must be controlled accurately for proper results. At the right the bird is being cleaned of feathers with a poultry picker.

19. Eggs collected 3 times daily, more often in freezing weather.
20. Lack of abnormal size, shape, and texture in eggs.
21. Proper handling, packing, and shipping of eggs. Protect from exposure to freezing, sunlight, rain, and rough handling.
22. Immediate cooling of eggs previous to packing.
23. Incubate eggs previous to 8 days of age.
24. Males going out of condition due to inaccessible feeders. Reels may be too close to box to allow large combed birds to feed freely.
25. Short circuits in water heaters will stop water consumption and birds will hesitate to use protected waterer long after its repair.
26. Shortage of calcium supply or inadequate and inconvenient feeding space.
27. Sharp beaks or hind toes on breeding males cause shy mating. Clip hind toes, if necessary.
28. Feeding of Breeder Ration for too short a time before eggs are saved for hatching.
29. Hatchability is inherited and certain families may carry, or evidence when crossed, lethal genes which, when present cause high embryonic mortality.
30. Presence of defective interior quality in eggs, such as loose air cells, watery white, or blood spots.

Temperature is known to affect the activity of birds. Exposure to low temperatures in pens poorly insulated or protected from drafts will reduce activity and cause infrequent matings. More frequent feedings in small amounts will stimulate bird activity and frequency of matings.

Recent work at the Tennessee Agr. Exp. Station has indicated rather conclusively that when feed was restricted to breeding cockerels their fertilizing ability was materially reduced. When birds were so restricted on feed intake that body weight was lost their capacity to produce sperms was limited. Some males on test after being restricted on feed intake for a period of 2 months ceased to produce semen entirely. This work has a very practical significance for it is not unusual for breeding males to lose weight during the mating season. When this happens, fertility goes down. This is one good argument for the provision of special male feeders in the breeding pen.

Feeding the Breeders

The reader is referred to the section on "Feeding the Layers," for what is essential in securing adequate and proper nutrition of market egg producers, holds equally as well with the birds used for breeding purposes. The primary difference in the required nutrition of breeders, as compared to market egg producers, is the need of these breeding birds for additional quantities of vitamins and certain other higher cost ingredients. This need, which when adequately supplied in the mixed diet, enables better health and greater hatching power of eggs produced with a subsequent high grade of baby chick.

Merrimack Breeder Mash, Merrimack Super Mash and Merrimack All Mash have been compounded to provide highest values and nutrient qualities for breeding birds. The first ration is designed for use with hard grain feeding, whereas the Super and All Mash rations are complete mashes which should be fed with no hard grains. These rations contain valuable and adequate amounts of animal proteins, riboflavin concentrate, A and D feeding oils, and other essentials, all of which are needed for high hatchability and good livability of chicks.

Those who prefer to follow the grain-mash system should select Merrimack Breeder Mash for the mash portion of the feed. This can be supplemented with Merrimack Scratch Feed in the ratio of about 60 parts mash to 40 parts of grain. When hard grains are fed to excess, the dilution of the nutrient factors contained in the mash may be sufficient to reduce hatchability as well as rate of egg production. Caution should be taken not to over-feed hard grains.

Merrimack Breeder Mash, Merrimack Super Mash and Merrimack All Mash rations should always be supplemented with oyster shells, grit, and water for complete nutrition. When conditions require, pellets, moist mash, condensed milk, or Merrimack Poultry Fitting

Ration can be used as in the treatment of laying birds.

Should the occasion develop where a flock has been fed a laying mash and it is desired to produce hatching eggs, such a flock should be mated with top quality breeding males and the feed changed to Merrimack Breeder Mash, Merrimack Super Mash or Merrimack All Mash at least 3 weeks and preferably one month before eggs are saved for hatching purposes.

Feeding and Management During Hot Weather

While the complete routine of operation under extremely high temperatures cannot be given herein, we do believe certain definite variations in the usual method of routines can be helpful and will return value.

During hot weather birds are much less active in feeding and drinking. This can at once be remedied by providing extra convenient feeding and watering space.

The use of Merrimack Hi-Pro-Vite Pellets, condensed milk, Merrimack Poultry Fitting Ration (light useage), Merrimycin or wet mash will aid feed intake.

Make pens more comfortable by painting roofs white or aluminum in color. This reflects the sun's rays and thus reduces inside temperatures. Open windows full and install fans, if necessary, moving air is cooling as compared with still air.

Mist spray side walls and ceiling with water. Its rapid evaporation causes cooling. Running water on roof will cool inside pen temperature. If white-wash has been used on roof, water will only wash it off.

Collect eggs twice as frequently. They too will evaporate and show lower interior market quality or lower hatchability.

Furnish birds with all-night lights to aid in feed consumption during relative coolness of the evening and early morning hours. A fresh group of active young males (6-7 months of age)

to replace older breeding males may aid fertility and subsequent hatchability.

MERRIMACK'S FEEDING RECOMMENDATIONS

For Hatching Egg Production

THE COMPLETE SYSTEM

A suggested feed routine with morning light application is as follows:

- 3:30 A. M.—Artificial lights go on. Un-frozen water, Merrimack All Mash or Super Mash, oyster shells, and grit, or calcite crystals are available.
- 7:30 A. M.—(Approx.) Lights go off.
- 8:00 A. M.—Supply fresh Merrimack All Mash or Super Mash—collect eggs, clean waterers.
- 11:00 A. M.—Feed $\frac{1}{4}$ daily allotment Merrimack All Mash Pellets or Super Mash Pellets in feed hoppers. Collect eggs.
- 2:00 P. M.—Collect eggs. Check on All Mash or Super Mash supply. Stir feed in hoppers.
- 3:00 P. M.—Feed fresh Merrimack feed.
- 4:30 P. M.—Feed $\frac{3}{4}$ daily allotment of All Mash or Super Mash Pellets. Collect eggs.
(Provide a minimum of four 5-ft. mash hoppers per 100 birds.)

THE GRAIN-MASH SYSTEM

A suggested feed routine with morning light application is as follows:

- 3:30 A. M.—Artificial lights go on. Un-frozen water, Merrimack Breeder Mash, oyster shells, and grit or calcite crystals are available.
- 7:30 A. M.—(Approx.) Lights go off.
- 8:00 A. M.—Supply fresh Merrimack Breeder Mash. Collect eggs. Clean waterers.
- 11:00 A. M.—Feed daily allotment of Merrimack Breeder Pellets in feed hoppers. Collect eggs.
- 2:00 P. M.—Collect eggs. Check mash supply. Stir feed in hoppers.
- 3:00 P. M.—Feed Merrimack Breeder Mash.
- 4:30 P. M.—Feed $\frac{3}{4}$ daily allotment Merrimack Scratch in litter. Collect eggs.
- After dark—Scatter in litter $\frac{1}{4}$ daily allotment of Merrimack Scratch. It is then available to birds when they come off the roosts—3:30 A. M.
(Provide a minimum of three 5-ft. mash hoppers per 100 birds.)

Cannibalism

Probably everyone who has kept chickens has at one time or another experienced some form of cannibalism in those birds. These associated troubles

of feather picking, toe picking, pick outs, and torn abdomens have been the cause of numerous losses to poultry keepers for many years.

At the present time, we still have no absolute cure for the condition. No one has proved its true cause, but we do know certain things which are contributory to this vice.

When pullets are recently housed and production rapidly climbs, several birds appear with a prolapsus. Such birds, in trying to lay an extra large egg, develop a sufficient peristaltic pressure which (together with weak muscular attachment) results in the eversion of the oviduct from the body. This usually bloody appearing organ is quickly picked by other birds and when ruptured, a pick-out has occurred and a dead bird results.

Recent work at the U. S. Regional Research Laboratory at East Lansing, Michigan, reveals that the female hormone plays a part in the prolapse condition of certain birds. This hormone in sufficient amount controls action of the ligaments of the oviduct, the pubic spread, size of vent, and the pliability of the abdomen. An over-production of this hormone can increase prolapse troubles.

True cannibals will pick apparently without reason. They may pick at any

point on the body of a likely victim, draw blood, and then the trouble proceeds. Others are initiated to the taste of blood and more cannibals develop. Only by reducing possible blood breaks through extremely quick observation and rapid removal from flock can this method of spread be controlled.

Whenever a picked bird is observed, remove, treat the picked area with tar, and, if the bird is not too severely torn, return to the pen.

Tar covering protects and discourages other pickers. Reclaim those birds severely torn by immediate bleeding and prepare for home or market use.

While overcrowding, lack of feed space, extra light pens, mixed ages of birds in same pens, infrequent feeding or attendance in pen are all contributory causes, we still do not have the real answer.

Control measures of salt in drinking water for 2 or 3 days, extra salt in mash, feeding greens, placing pine bows within the pen, extra use of animal protein, increased frequency of feedings, adding waste paper to pen for birds to pick on, using extra deep litter when grain feeding, and using more whole oats in diet either in controlled amount or available in open hopper have all been tried and found lacking at times. Sometimes one or

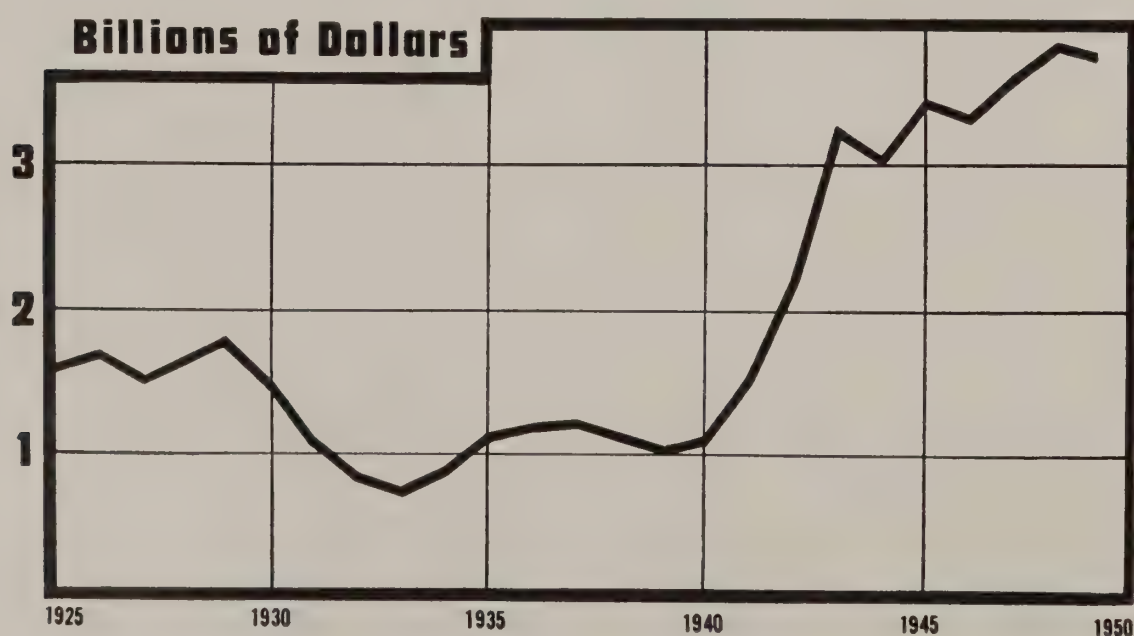


FIGURE 2. Gross income from poultry and poultry products, United States, 1925 to 1949. Data from B. A. E.

the other will work under certain conditions.

Probably the best means of control is by use of the debeaker, an electric device which sears off approximately $\frac{3}{8}$ " of the upper mandible of the beak. With proper use of this instrument the cannibalistic trait can be stopped. A bird so treated cannot pick another and do damage. We thoroughly recommend such a treatment when needed.

The application of anti-pick devices to the beak is also to be recommended. One should study costs involved and probable safety provided before making the choice between anti-pick devices and electric debeaking.

Water Supply

It is such a convenience to have running water under pressure that the efficient, up-to-date, progressive poultryman should not and cannot be without it. No longer can the real poultry operator afford to expend long hours at high labor rates to haul the necessary quantities of drinking and wash water so essential on every poultry farm.

Why is an adequate source of water so important? Consider first that about 60 per cent of your body content is water with individual tissues containing as high as 90 per cent. Should your poultry, your livestock, or even you, yourself, suffer a loss of more than 10 per cent of body water reserves, the result would probably be death.

Water is an ideal dispersing agent for body use as a solvent and for ionizing properties. Its high specific heat enables it to serve as a cooling mechanism by absorbing body heat and its removal by way of respiration or perspiration. If body heat were not dissipated, albuminous substances would coagulate. Water serves to transport metabolic products, forms secretions and excretions, synovial fluid for lubrication, cerebrospinal fluid to cushion nervous system, and serves as a sound transport medium.

In poultry especially, besides the above essential body functions, water is necessary for egg production. Restricting water supply is a sure way to reduce egg laying performance. Those baby chicks can easily dehydrate without a sufficient and available water supply. An immediate change from one type of water utensil to another can mean loss of water intake and weak or dead chickens. Make the change gradually. Are you feeding high protein or low protein diets to the chickens? If high, more water is required and more droppings are being excreted. Diets of high soybean content have been reported to increase the water requirement.

If interested in getting a quick and ready acceptance of drinking water by chicks, perhaps you should use a bit of green vegetable coloring in it. A mid-western college has reported best water intake when colored green, followed by red, brown, and clear.

Not only is water so essential to your own body or to the animal body but, consider the farm livestock which you are or could be taking care of with an automatic water system. A flock of 100 growing chickens from 6 to 12 weeks of age will consume from 3 to 4 gallons of water daily. A group of 100 dual purpose laying birds require about 45 to 60 pounds of water daily just for drinking purposes. When one adds the extras for washing utensils, spraying, or disinfecting, washing out pens, washing eggs, and the multiple other uses commonly encountered, this figure can easily double. Why should you haul nearly a pound of weight for every layer on the farm, every day in the year when it is so easy to install an automatic water system? For easy figuring, one steer, one dairy cow, four sheep, or two pigs will consume about the same amount of water as 150 laying hens.

To delve back into history for a moment, it is interesting to note that the first steam-driven pumps were built in 1870. Not until 1914 were the first automatic home and farm

water systems pioneered by Fairbanks, Morse Company. Some 12 years later, this same company installed a modern production line to turn out volume production and reduce the cost of complete water systems so that they could be available economically to the general public.

Electric water systems are ideal where electricity is available, but they are not the only power unit offered. Those operators not so favored as to have power lines running to the farm can easily procure engine-driven outfits. Sizes of pumps will vary from 200 to 10,000-gallon capacity per hour for what are termed shallow well systems and up to some 5000 gallons per hour for deep wells. Briefly, shallow well pumps are designed for use in wells

up to 22 feet in depth, placed over or relatively near the water source; ejector pumps may be 100 feet or more from the well and still handle depths up to 130 feet, and deep well plunger pumps are placed directly over the well but will pump more than 300 feet to a pressure storage tank.

Just add it all together and you will see the problem you, as a poultryman, or as a general livestock farmer have to solve. It is so much easier when all one has to do is to turn a faucet to get water.

If you can't turn that faucet now in the hen house, the stable, the dairy barn, the pig yard, the orchard, in the garden, or in the home, call now for Merrimack automatic water system service. Estimates, of course, are free.



One of the many flocks fed on Merrimack All Mash. These are Rhode Island Reds.

Turkeys and Geese

The turkey industry in this and neighboring states is a big business. It has an approximate value of \$200,000,000 in the United States. To raise the more than 30 million birds requires an estimated million and a third tons of feed concentrates.

The most popular breeds in this area are the Broad-Breasted Bronze and the White Holland. Regardless of the breed selected, it is well to remember that quality poults, free from disease, are essential for a profitable start.

Management

General feeding and management details applicable to chickens are similar for turkeys except that the special nutritive requirements for turkeys emphasize the need for using specially designed turkey rations. These are readily available at all Merrimack stores.

Generally speaking, a brood unit of 150 poults is considered the proper size, whereas that for baby chicks is about double this number. Since growing turkeys are especially liable to blackhead infestation and subsequent mortality, sanitation is of utmost importance in any rearing program. Chickens many times carry the blackhead organism without effect. They should be kept entirely separate from turkeys and the ground used by them not used by turkeys.

We have been told that turkeys have a peculiar angle of sight and that whereas they can fly up and over a 5 or 6 foot high fence they cannot sight the top wire of a 30 inch high fence. If you try to confine turkeys on range with such a fence write us and let us know the results. We don't guarantee it.

Brooding

The general brooding conditions required for turkey poults are quite similar to those used for chicks. It is well

to remember that if wire floors are used under a brooder, slightly higher temperatures may be required to offset possible floor drafts and lack of the available warm litter material.

Floor space requirements for turkey poults should generally be considered about double that of baby chicks and at all ages. Baby poults start with 1 square foot of space allowance while near adults have more than 6 square feet.

APPROXIMATE FEED CONSUMPTION
AND WEIGHT OF BRONZE TURKEYS
BY SPECIFIC PERIODS*

Age	Feed Consumed (Total)	Weight in Pounds	
		Males	Females
At Hatch		.14	.14
To 4 weeks	2.75 lbs.	.85	.80
To 8 weeks	6.00 lbs.	3.25	2.75
To 12 weeks	14.00 lbs.	6.50	5.25
To 16 weeks	26.00 lbs.	11.50	8.00
To 20 weeks	40.00 lbs.	15.00	11.00
To 24 weeks	58.00 lbs.	18.50	12.00
To 28 weeks	76.00 lbs.	25.00	14.00

* These figures are estimates as compiled from several sources and should merely be used as guides to your own results. Variation of 20 per cent increase in final figures may apply.

ESTIMATED WATER REQUIREMENTS
PER 100 TURKEYS

Up to 8 weeks of age	250 gallons
8 to 16 weeks of age	750 gallons
16 to 24 weeks of age	850 gallons
Total to 24 weeks	1850 gallons

Some say baby chicks are hard to teach to eat, but turkey poults are usually in need of somewhat more attention during the initial feed period. Aids such as full feeders, bright colored marbles, or short green clippings on top of feed, and the use of dried whey in water solution as a drink will help.

Some operators will add 5 pounds of corn oil to 100 pounds of mash for the first 2 days of feeding turkey poults. The odor, as well as yellow color creates a desire to eat.

Feeding

Merrimack Turkey Starter Mash is recommended as the first feed for baby poults and this should be continued up to 6 to 8 weeks of age. Water or liquid milk or whey plus granite grit should always be available. When poults are placed under brooder, dip their beaks in feed and water containers before releasing. This thoughtful practice prevents many early deaths.

At 4 weeks of age, begin to add intermediate size scratch feed. Feed twice daily the amount which is readily consumed within 15 minutes. As age increases and birds are able to consume the whole size grains, substitute for the cracked grains and increase the amount slightly. When birds reach the age of 16 weeks, they should be consuming about equal parts by weight of mash and scratch.

After the initial 6- to 8-week period, change from Merrimack Turkey Starter Mash to Merrimack Turkey Growing Mash. This may be fed entirely in the form of pellets if desired. As turkeys mature, the size of granite grit being supplied should increase to the so-called turkey size grit. The use of such grit increases the efficiency of feed utilization and means less feed wastage.

If one intends to keep a certain quantity of breeders until the next hatching season, make the selection early and before any birds are marketed. Such birds to be kept as breeders should be changed to Merrimack Turkey Breeder Mash at least one month prior to saving of hatching eggs. This pre-feeding insures highest hatchability and top quality of resultant poults.

Pointers on the Raising of Geese

Geese are not difficult to raise. The same principles of chick raising will apply to that of raising goslings with only a few changes.

Baby geese (goslings) grow very rapidly and will attain approximately

12 pounds in 12 weeks. Variations, of course, are common but good management means good growth with few losses.

A space allowance up to four weeks of age of 1½ square feet per gosling should be allowed. Water and feed space allowances should be just double that of baby chicks. Use open top feeders since goslings need plenty of room to enter their bill into the feeder. Fill open feeders only half full to reduce the amount of waste feed.

Brooder heat for the first week of life can be 85° F. and this reduced about 5° F. each following week. Supplementary heat usually can be discontinued by the third or fourth week with reasonable weather conditions. If unsure, provide heat a bit longer.

Make use of the brooder guard for the first week for it teaches the goslings where heat source is and many times will prevent pile-ups. Remove this guard after the first week.

Up to the fifth week one should provide relatively confined drinking area as a means of keeping goslings from walking through waterer. After this time they may be allowed larger open waterers without much danger of exposure.

Feed supply for goslings can well be Merrimack All Mash in pellet form or fed as a moistened mash. However, the use of Merrimack Fast-Gro Starter and Broiler NIBBLES is preferable for more rapid growth. This same feed can be provided throughout the growing period.

Following the initial confinement for two weeks, goslings may be allowed use of a restricted outside range yard. Provide easy access in and out of brooder house by making a low-angled incline from ground to house opening.

Little purchased feed is required after 6-8 weeks of age when ample range feed is available. Goslings consume large amounts of green food and insects while on the range. Good green food on range area with an adequate provision of water either artificial or natural supply is about all that is

needed. Those wanting rapid gains for market purposes will provide a continuous supply of Merrimack Fast-Gro Nibbles, granite grit, and water.

Diseases seldom bother geese but coccidiosis can affect them. Similar

treatment or control measures are used as for chickens. (See page 68.)

A few weeks before geese are shipped to market or dressed for retail sale feed rather fully on Merrimack Fast-Gro Starter and Broiler Pellets.

Poultry Diseases and Parasites

Before the discussion of poultry diseases, it is well to review a statement made several years ago by an official of the Food and Drug Administration: "Tonics, conditioners, regulators, and mineral mixtures have little, if any, value in increasing growth and egg production or creating resistance to infections or virus diseases." This statement is still wholly true and poultrymen should realize it.

There is no known drug effective in the cure of fowl typhoid, coccidiosis, fowl pest, chicken pox, pullorum, leucosis, laryngotracheitis, limber neck, blackhead, certain tapeworm infestations, gapes of chicks, tuberculosis, or infectious bronchitis. Perhaps more disease conditions might be added to this list but it is sufficient to indicate to all poultry keepers the truth of the statement that "an ounce of prevention is worth a pound of cure."

The development of the sulpha drugs, particularly sulfaguanidine, sulfamethazine, sulfaquinoxaline, and later nitrophenide have proven of material aid in the control of mortality from coccidiosis. The named drugs also aid in controlling immediate mortality from pullorum and cholera. Though mortality is stopped, birds which have recovered from pullorum and cholera still remain as carriers of the disease.

This "ounce of prevention" implies thorough use of sanitation on all poultry farms. This means to provide surroundings that are safe for poultry to live in with protection from undue exposure to disease organisms, such as bacteria, viruses, and parasites.

Actions which can well be employed in the prevention of disease and its spread might include:

1. Prohibit visitors from entering pens.
2. Do not enter pens of your neighbor.
3. Do not borrow or lend poultry equipment.
4. Restrict your farm help on keeping poultry at their home.
5. Quarantine new live bird arrivals for three weeks. Know past disease history.

6. Disinfect all incoming crates.
7. Rear young stock away from adult birds.
8. Incinerate or deeply bury all dead birds.
9. Inspect birds each month for lice or mites.
10. Reduce fly and mosquito presence.
11. Clean up and eliminate manure piles as soon as possible.
12. Eliminate rats and mice.
13. Keep entryways and feed rooms clean.
14. Use disinfectants at proper strength. Merrimack Coal Tar (4 Plus) disinfectant may be diluted 1:80.
15. Be continually observant as to general condition of birds. If treatment is called for, do not delay.

Disinfectants and Their Uses

The only proper way to disinfect is: (1) Purchase product of high phenol coefficient, (2) make proper dilutions of article selected according to directions, and (3) apply to surface thoroughly and get full coverage with the solution. By phenol coefficient is meant the relative killing power of a phenol-like disinfectant when compared under similar conditions with pure carbolic acid or phenol. When carbolic acid is diluted to a 5 per cent solution it is considered powerful enough to do a thorough job of killing disease producing bacteria. Merrimack Coal Tar disinfectant (4-Plus), which is available in all Merrimack stores, is more than equivalent in phenol value to pure carbolic acid and may be used in a solution of one part to 80 parts of water.

Many folks believe that lime or white wash has disinfecting value when spread about a ground area previously contaminated or when painted on interior house surfaces. This depends entirely upon whether this lime or whitewash is freshly "slaked" or made from such material. Quick lime readily converts by exposure to air and moisture to an air slaked basis or to a carbonate of lime which is entirely worthless as a disinfectant. Freshly slaked lime in a thick paste mixture with water is an effective disinfectant.

It must be used immediately or stored in tightly closed containers to prevent its deterioration. To prepare, mix in proportions of 1 part by weight of water to 2 parts of quick lime. On mixing be extremely careful for the quick heat generated can cause explosions and severe burns or eye scalds. The above mixture is later diluted for proper spraying or brushing consistency. For those who prefer to use a white wash the following formula is highly recommended. Mix hydrated lime to consistency of putty. To one-half pail of this whitewash putty add one quart of linseed oil and mix thoroughly. Reduce to brushing or spraying consistency with water.

It is possible to prepare a white wash formula which does have some disinfecting value. This is based on the inclusion of formaldehyde in the formula. Such a mixture recommended by a large chemical manufacturing concern is made up as follows: 7 pounds slaked lime; 6 ounces glue, and 6 ounces formalin mixed well in $2\frac{1}{2}$ gallons of water. This mixture will make a full 14 quart pail of white wash with full disinfectant value.

Another whitewash formula that may be of interest to New Englanders comes from South Carolina. Mix 5 qts. fresh slaked lime, 1 qt. kerosene, 1 qt. coal tar disinfectant and $6\frac{1}{2}$ qts. hot water to dilute for spraying. To make this solution stick to walls and surfaces add one pound of lard to each 10 qts. and one cup of salt. This will kill mites on contact as well as bacterial life.

There are available on the market certain products which combine the characteristics of a white wash plus disinfecting value and insect killing properties. Such products are available in all Merrimack stores.

Incubator Fumigation

All incubator operators should invest in "fumigation insurance." By so doing one is able to control or elimin-

ate several subsequent disorders which might otherwise appear in the chicks and cause severe losses. The cost of the procedure is negligible when one considers the benefits which may be secured.

The procedure consists of the regular practice and use of fumigant within the incubator during the incubation period. The most generally recommended time where one fumigation is used is on the eighteenth day of each setting, or just after eggs have been transferred to the hatching compartment.

The fumigant used is formaldehyde gas which is released by evaporation of formalin, or when potassium permanganate is added to 40 per cent liquid formalin. General steps in the procedure follow.

1. Maintain high degree of humidity within machine, preferably 90° wet bulb reading.
2. Secure and measure out proper amounts of the fumigant reagents.
3. Place permanganate crystals in small pan which is placed within a larger pan to take care of possible boiling over.
4. Place all on incubator or hatching compartment floor and pour the proper amount of formalin over the crystals.
5. Close door immediately, allow exposure to gas for at least 30 minutes, after which clear gas from machine by ventilation.

Occasionally a hatcheryman is bothered by the condition in chicks known as naval infection or mushy chick disease. The organism causing this condition can be controlled by thoroughly cleaning trays and compartments within the machine, and then fumigating as usual but with approximately three times the amount of gas as normally used. Naturally, when such a treatment is given no chicks must be out of the shell. Choose a day between hatches to treat the contaminated machine.

RECOMMENDED AMOUNTS OF RE-
AGENTS USED FOR NORMAL
FUMIGATION

Cubic Feet of Air Space	Amount of Formalin	Amount of Potassium Permanganate
10	1 teaspoonful	$\frac{1}{2}$ teaspoonful
50	5 teaspoonfuls	$2\frac{1}{2}$ teaspoonfuls
100	$\frac{1}{4}$ cup	$\frac{1}{8}$ cup
400	1 cup	$\frac{1}{2}$ cup

Diseases:

Pullorum:

Causative Agent—Salmonella Pullorum.

Symptoms—Huddling, pasting of vent, heavy mortality 1 to 21 days, droopy wings, extreme weakness.

Post Mortem Lesions—Yellow liver, nodules on lungs, liver, or heart, unabsorbed yolk sac, congested lungs.

Treatment—There is still no positive known cure of this disease. However, recent development of the sulfa drugs and antibiotics has shown that these in powder or solution form are effective in the control and reduction of possible high mortality. When used in the control of this disease and bird recovers, it is still a carrier and can transmit the disease to other birds. It is effective only on chicks under 2 weeks of age.

Prevention—Purchase chicks or hatching eggs solely from flocks shown to be free of this disease by the official tube agglutination test. Contact the State Department of Agriculture for a list of such free flocks.

NOTE: The University of Tennessee reports that the feeding of certain amino acids in nutrient broth for growing cultures of *Salmonella Pullorum*, i.e., valine, hydroxyproline, cystine or threonine turns *S. Pullorum* into harmless organisms. "The concentration of these amino acids in the blood and body tissues

may have much to do in determining whether or not poultry can resist the disease," say these researchers.

Paratyphoid:

Causative Agent—Salmonella bacteria.

Symptoms—Weakness in poults, sudden mortality, ruffled appearance, diarrhea, fluid in heart sac, pale liver.

Treatment—None.

Prevention—Purchase poults from sources known to be as free from this infection as possible. The blood test used in the detection of this disease is not perfect due to multiplicity of bacterial types causing the disease.

Rickets:

Causative Agent—Lack of sufficient vitamin D in diet or of the proper mineral balance.

Symptoms—Leg weakness, rubbery condition of bones and of beak, uneven growth, beading of ribs.

Treatment—Correct nutrient deficiency or imbalance.

Prevention—Feed an adequate balanced diet such as those sold at all Merrimack Stores.

Ulcerated Gizzards:

Causative Agent—Unknown.

Symptoms—Uneven growth, weakness, some mortality when another secondary disease is present. May occur from one week to maturity. Ulcers or extremely roughened gizzard lining. Lining may peel from tissue.

Treatment—Use copper sulphate solution. Dissolve $\frac{1}{2}$ pound copper sulphate crystals in one gallon of water as a stock solution. Add 2 tablespoonfuls of this solution to each gallon of drinking water. Feed every other day for period of two weeks. When metal waterers are used, the addition of 1 to 2

tablespoonfuls of vinegar to each container will aid in preventing the action of copper eating into and destroying metalware. The use of Merrimack Poultry Fitting Ration is recommended as a means of treatment through its ability to provide a slight intestinal stimulation and increased feed intake. Feed daily on top of the regular mash 3 to 4 pounds per 100 birds along with the water treatment.

Prevention—Sanitation and elimination of other disease conditions at the same time will mean little loss or even notice of the ulcerated gizzard condition.

Catarrhal Enteritis (infectious):

Causative Agent—Protozoan parasites known as hexamita and trichomonas.

Symptoms—Sick poult, watery droppings, inflammation of intestines. Final diagnosis made by microscopic identification of causative agents.

Immediately upon diagnosis of this condition the use of Merrimycin, a high efficiency feed containing 200 grams aureomycin hydrochloride per ton should be started. Feed according to directions on tag and continue for a period of about one week in total.

Treatment—The use of copper sulfate solution as noted under Ulcerated Gizzards is recommended. Thorough sanitation and cleanliness of litter.

Prevention—Remove excess droppings and renew litter frequently within brooder pens. Adequate segregation of young poult from adult stock.

Pneumonia:

Causative Agent—Mismanagement.

Symptoms—Huddling around stove, weakness, emaciation, uneven growth, congested lungs, pasting of vent.

Treatment—Correct brooder temperature and prevent crowding. Temperature may be either too high or too low.

Prevention—Correct brooding conditions.

Kerato-Conjunctivitis:

Symptoms—This so-called condition results in various stages of inflammation of the lining of the eyelid and of the eyeball. It has been associated with poor ventilation and high ammonia content of the air in the pen. It seems more common during the winter brooding period.

Treatment—Provide adequate ventilation. Better litter management is essential to maintain dryness and a lowered release of ammonia gas. Addition of lime to old, damp litter may be a causative factor.

Epidemic Tremors:

Causative Agent—Believed to be a filterable agent—unknown.

Symptoms—Head, neck, and tail show rapid tremors especially when excited, uneven growth, leg weakness with unsteady gait.

Treatment—No control measure known.

Prevention—Unknown.

Infectious Bronchitis:

Causative Agent—Filterable virus.

Symptoms—Similar to pneumonia, with gasping, coughing, and rattling. Bronchial tubes filled with mucous, may be some hemorrhage in lower part of trachea. Air sacs cloudy with cheesy accumulations on membrane.

Treatment—Provide extra warmth with ventilation, feed extra A and D feeding oil, dust chicks with chlorine powder. Sulfathiazole has been tried as an aid in reducing severity of symptoms. It will not stop the infection. During any case of bronchitis whether it be a natural

“break” or self-induced through inoculation, the feeder should do all that is possible to hold or build feed intake. The better the feed consumption, usually, the sooner birds will recover. Merrimack Poultry Fitting Ration or Merri-mycin, preferably, is ideal as a supplement to the usual feeding routine and aids total feed intake as well as supplying high nutritive value.

A high level penicillin soluble tablet for use as a water treatment in controlling secondary infections which complicate this disease has been used with good success. It stimulates appetite and enables birds to build their immunity and not suffer from miscellaneous complicating infections.

Prevention—Elimination of all carriers from the premises will, of course, remove the infection. With the high general infection in all poultry areas, however, no guarantee of safety from this infection can be assured. We believe it best to inoculate growing birds from 4 to 15 weeks of age with the virus, procurable from your STATE COLLEGE POULTRY PATHOLOGY LABORATORY. Once having had this disease, birds are usually immune from a subsequent outbreak. Adults on premises at the time of inoculation are subject to infection unless immune. Use care in treatment.

Navel Ill—“Mushy Chick” Disease:

Causative Agent—Bacterial organism.

Symptoms—Infected navel, swollen and soft abdomen, offensive odor, heavy mortality 1 to 5 days.

Treatment—None.

Prevention—Proper incubator sanitation and fumigation. As little as 0.2 of a degree above normal incubation temperature may cause rough navels. Be sure of proper temperature especially in last week.

Coccidiosis—Acute Type:

Causative Agent—*Eimeria Tenella*.

Symptoms—Bloody droppings, droopy wings and tail, huddling, loss of yellow pigment in shanks and red color in combs and wattles, heavy mortality, ceca enlarged with hemorrhage of tissue.

Treatments—Increase warmth of pen. Dispose of most severely affected



Comparison photo of normal and abnormal shank bones of pullet layers. The bird on the right is affected with osteopetrotic lymphomatosis, the bone type of the leucosis complex. There is no known cure.

USE OF LIQUID SULFAQUINOXALINE

Add liquid sulfaquinoxaline to drinking water at the rate of 1 ounce (2 tablespoons) to 1 gallon of drinking water. Use on an intermittent schedule of 2 full days of treatment, skip 3 days, then repeat followed by a final treatment for 2 days. In a severe outbreak, use 1½ ounces to 1 gallon of water.

For reference use we list herewith the various known species of coccidia affecting chickens. Only the first four mentioned are known to cause mortality. *Eimeria Tenella* (cecal coccidiosis), *E. Necatrix*, *E. brunetti*, *E. maxima*, *E. acervulina*, *E. hagani*, *E. praecox*, *E. mitis*.

chicks. (1) Feed liquid sulfaquinoxaline in the drinking water according to directions at first sign of symptoms. This will usually stop further losses. (2) Feed Merrimack Hi-Level Sulfa Mash according to directions on reverse side of feed tag.

Prevention—Thorough sanitation and closer watch on management. Less crowding of chicks. Feed all chicks from day-old to 12 weeks of age on Merrimack feeds containing 0.0175 per cent sulfaquinoxaline in powder form.

Coccidiosis—Chronic Type:

Causative Agent—E. Necatrix and others.

Symptoms—Little blood in droppings, huddling, paleness, birds lose weight, outer surface of intestine shows white or red spots indicating localization of infection.

Treatment—Same as acute type. Epsom salts may be used if preferred, but do not mix treatments.

Prevention—Same as above. Use of built-up litter with frequent stirring has helped in getting some degree of immunity established.

Turkey Coccidiosis:

Causative Agent—E. Meleagridis and E. Meleagrimitis.

Symptoms—Birds droopy, ruffled feathers, paleness, light brownish diarrhea with mucous. Large intestine is inflamed with reddened walls.

Treatment—Similar to that of coccidiosis in chickens.

Prevention—Thorough sanitation will assist in prevention of disease. Continuous treatment by use of 0.0175 per cent sulfaquinoxaline in feed or intermittent use of 0.033 per cent in feed.

Antibiotics in the Control of Diseases:

Swine erysipelas in turkeys: One injection of 80-100,000 units of penicillin in oil (cost 10-15c).

Infectious sinusitis in turkeys: One injection of 100-125 milligrams of streptomycin directly into the sinus (cost 10-15c).

Mud Fever or Blue Comb: 100 grams or more per ton of mash of terramycin or aureomycin. Use for 3-4 days.

Non-specific enteritis: May have several causes. Some controlled by use of terramycin or aureomycin at rate of 100-200 grams per ton for three days.

Hexamitiasis of turkeys: 20 grams terramycin per 100 lbs. mash. One 25 mg. capsule per day for 3 days.

Blackhead:

Causative Agent—Histomonas meleagridis.

Symptoms—Enlargement of ceca, thickening of intestinal walls, sulphur colored droppings, liver enlarged, yellow green circular lesions on liver, pasty vent, mortality usually after 6 weeks of age.

Treatment—Thorough sanitation, range growing birds on wire cov-

EPSOM SALT DILUTION FOR FLUSHING PURPOSES*

Age of Chicks	Approx. Weight per 100 Birds	Amount of Epsom Salt	Amount of Water
1 week	12 pounds	2/3 tablespoon	2 1/3 quarts
2 "	25 "	1 2/3 "	4 1/2 "
4 "	50 "	5 "	8 "
6 "	100 "	10 "	12 "
8 "	166 "	1 cup	16 "
10 "	250 "	1/2 pound	20 "
Adults	500 "	1 "	24 "

* Adapted from data from U. N. H. Poultry Department.

ered platforms or frequently changed grass areas, flush treatment as in coccidiosis is recommended. The use of phenothiazine against cecal worms, carriers of the blackhead organism, is helpful. Mix one pound phenothiazine in 100 pounds of mash. Ten pounds of this mash fed as a moist mash once each week per 100 birds will assist in control if cecal worms should be the source. At first signs of an outbreak get correct diagnosis and then treat all birds either with a mash containing control level of aminonitrothiazole for a period of two weeks. Continue for one more week on $\frac{1}{2}$ control level. Control level is 0.1% aminonitrothiazole mixture.

Prevention—Practice thorough sanitation. Do not brood poults on land or in quarters previously used by turkeys or chickens unless thorough disinfection has been made. The continuous administration of soluble tablets of 2-amino-5-nitrothiazole in the drinking water making a 0.0137 per cent solution will prevent most outbreaks. Also the continuous feeding of rations containing a level of 0.05 per cent of this drug has been very helpful in preventing losses. Start feeding at about 4 weeks of age or just previous to time losses are usually encountered.

Crazy Chicks:

Causative Agent — This apparently is nutritional in origin and due to a lack in ability of certain chicks to utilize the vitamin E present in feed.

Symptoms—Chicks are “crazy,” walk unsteadily, tip backwards, and eventually lie on side with head retracted.

Treatment—Change to a fresh, hard grain or whole wheat diet for three days, or add 1 ounce wheat germ oil to 8 pounds mash, moisten and feed three times daily on top of mash.

Prevention—Start treatment at first evidence of need. Treat for coccidiosis at same time (it is so often present) to prevent excessive mortality. Feed extra greens. Use feeds containing added alphatocopherol.

Hexamitiasis:

Causative Agent—Hexamita.

Symptoms—These small organisms which infect the small intestine cause a marked dehydration of the body. High fever, rough feathers and diarrhea is common.

Control—The use of aminonitrothiazole 0.1 per cent in the mash for a period of nine days, one 25 mg. capsule of penicillin-G. per day for three days, and the feeding of Merrimack Merrimycin Mash for nine days will all control this disease of turkeys.

Coryza:

Causative Agent—Bacteria: *Hemophilus gallinarum*.

Symptoms—Discharge from nostrils, swelling of head over sinuses, coughing, and sneezing.

Treatment—Warm pens, feed extra cod liver or A and D feeding oil on surface of drinking water or in moist mash. Treat birds nightly with a chlorine dust such as H-T-H 15 or B-K. Sulfathiazole at $\frac{1}{2}$ per cent level in mash for 5 days will control this disease. The use of the soluble sodium salt of sulfathiazole in a 1:500 dilution for two days followed by three days of 1:1000 dilution in the drinking water is a very convenient method of treatment. The use of a soluble tablet carrying one million units of penicillin in 10 gallons of drinking water fed continuously for three days will cure this infection. This product, available at all Merrimack stores, is called Septicillin.

Prevention—Raise young stock in isolation from other birds, good

sanitation, remove carriers of the infection from premises.

Laryngotracheitis:

Causative Agent—Filterable virus.

Symptoms—Gasping, coughing with bloody mucous discharge, high mortality with very sudden deaths.

Treatment—Vaccination of unaffected birds immediately after diagnosis is made.

Prevention—Vaccinate young stock where outbreak has occurred or where vaccination has previously been used. Do not vaccinate unless positive of need.

Fowl Pox:

Causative Agent—Filterable virus.

Symptoms—Pimples, scabs, or sores on face, comb, and wattles, lowered egg production, lowered feed consumption.

Treatment—Vaccination. When used for non-laying birds the chicken strain fowl pox vaccine should be employed. If necessary to vaccinate laying birds, use the pigeon strain of vaccine.

Prevention—Continued yearly vaccination in areas where infection is present. Do not vaccinate if trouble has not previously been encountered or disease is not present in neighborhood.

Special Note

Vaccines for protection against Newcastle and Fowl Pox Diseases are available through all Merri-mack stores on advance order. Available for immediate sale from refrigerated storage at our Mill in Bow, N. H.

Leucosis:

Causative Agent—Unknown.

Symptoms—May evidence itself with "pearl" or grey eyes, "split pupil,"

tumors, leg or wing paralysis, enlarged spleen or liver, involvement of several internal organs such as kidneys and ovaries. Birds lose color in shanks and head parts and gradually reduce in body weight. "It is an infectious, contagious disease of chickens that is probably present in every flock in the United States. In addition to the many young chickens which die of this disease complex, it is estimated that one in every ten adult birds dies annually from this isidious disease. This mortality, when translated into monetary terms, means at least a one and one-fourth million dollar loss a week every week in the year." — B. Winton — U. S. D. A.

Treatment—No known treatment.

Prevention—Cull frequently, eliminate birds with off-color eyes, especially those with misshaped pupils. The faded iris together with a round pupil that reacts to light changes is not considered as ocular leucosis. Leucosis has been found to be inherited and through breeding progress, variable degrees of resistance have been established in flocks. The disease is easily transmitted from young to young and even from young adults to baby chicks. It is therefore recommended that replacement stock be brooded in separate units and far distant (200 yards) from adults.

Blue Comb (Avian Monocytosis):

Causative Agent—Unknown.

Symptoms—May occur any time after 6 weeks of age, lowered feed intake, droopiness, dehydration of shanks, shrivelling of comb and paleness followed by "blueness" or darkening of comb and wattles. Greenish diarrhea often present.

Treatment—(1) Use of copper sulphate solution as in Ulcerated Gizzards; (2) use of the following moist mash fed for a period of three hours every other day; 50 parts bran, 50 parts ground oats, 10 parts molasses, and 5 parts

of water to mix. Remove regularly fed mash from pens an hour or so previous to feeding this moist mash; (3) a third method of treatment which has been found to have some merit is the use of one tablespoonful potassium chloride per gallon of drinking water for a period of one week, followed if necessary, by 1½ per cent in the feed. Muriate of potash fertilizer can be used instead of the chloride; (4) use Merrimack Poultry Fitting Ration in small amounts on top of the regularly fed mash, several times daily. This will supply high nutritive value plus molasses in an amount exceeding that of the above given mixture. This higher nutritional balance serves to repair damaged tissue and assist in rapid recovery. (5) The use of Merri-mycin Mash (available at all Merrimack stores) for a period of 4 to seven days is recommended as a treatment for Blue Comb. The combination treatment of (5) with (1), (3) or (4) above can be used.

Cholera:

Causative Agent—Pasteurella avisepticus.

Symptoms—In acute form sudden deaths, chronic form slow deaths. Combs pale followed by dullness and eventual blue color. Birds consume extra quantities of water. Hemorrhages noted on internal organs, especially heart. Greenish or yellow diarrhea.

Treatment—Use of sulpha drugs, i.e., sulfaquinoxaline, in feed at rate of 0.05-0.1% or in drinking water, will reduce mortality but will not cure the infection. Birds which may survive remain as carriers. Thorough sanitation and depopulation are the only effective means of eliminating infection.

Newcastle Disease—

(Pneumo-encephalitis):

Causative Agent—A virus.

Symptoms—May affect young or old birds. Heavy mortality is common in young birds, but may be very little in laying birds. All birds so affected may show respiratory troubles associated with nervous or paralytic symptoms. Tremors of head, twisted necks, or other paralysis is common but not always present. Visible symptoms resemble colds or bronchitis. Producing birds stop laying within one week.

Treatment—Isolate completely affected pens. If sure of Newcastle Disease start vaccinating those pens still not showing respiratory effects. If it has spread over entire flock vaccination will not be useful as it takes about 14 days to build an immunity. Only good nursing care with frequent feeding in small amounts of Merrimycin and Merrimack Poultry Fitting Ration will assist in quick recovery. The best treatment is to vaccinate birds before they are exposed to the infection, with A.S.L. intranasal vaccine for day old chicks followed by A.S.L. wing web vaccine previous to being housed as layers.

Cure—Unknown.

Prevention—Thorough sanitation, elimination of rats and other disease carriers. Strict quarantine of premises if disease breaks in your locality. Disinfectants such as a 2

Special Note

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per cent solution of sodium hydroxide or a 1 per cent solution of liquor cresolin saponatus U. S. P. have proven effective in killing the virus. A 4 per cent formalin solution is effective only after 1 hour exposure. Dipping hatching eggs in a 2 per cent solution of lye for 5 minutes is reported effective in killing Newcastle virus.

Fowl Typhoid:

Causative Agent—Microscopic organism—*Shigella Gallinarium*.

Symptoms—Droopiness, yellow or greenish diarrhea. Liver may be enlarged with greenish sheen, do not confuse with those of blue comb. Get accurate diagnosis through laboratory.

Treatment—Use of sulfa drugs will aid in partial control of death losses. No truly effective method of treatment.

Cure—None.

Prevention—Practice thorough sanitation with adequate use of coal tar disinfectants. Blood test usual means of determining carriers. These can be eliminated. Once disease is found on the farm, it spreads fast and best means of control and prevention is to depopulate.

Botulism:

Causative Agent—*Clostridium botulinus*.

Symptoms—Wry neck, head and neck hang at a peculiar angle, unsteady gait, possible convulsive actions.

Prevention—Remove possible sources of infectious bacteria, such as, dead animals, rotten or putrid flesh or animal matter. May be associated with droppings accumulations if birds have access.

Treatment—High level antibiotic treatment may assist. Use a purgative dose of epsom salts at first notice of condition.

Favus:

Causative Agent—A fungus. *Lophophyton Gallinae*. Contagious through contact.

Symptoms—Shows on head and face parts as a dry, white, scaly condition. In advanced cases may extend to main body skin. Birds usually weakened and eventually die in most advanced cases.

Treatment—Remove affected birds. If of sufficient value, isolate from normal birds and treat daily by applications to affected areas with tincture of iodine, formalin ointment, or even carbolated vaseline. A single treatment with a mixture of quaternary ammonia compounds has been reported to cure. Calcium propionate, as a wash, has also been used with success.

Internal Parasites

Round Worms:

Causative Agents—*Capillaria* of various species.

Symptoms—Severe inflammation and thickening of intestinal lining, weakness and emaciation are after results, loss of body weight, lowered production, worms in intestines.

Life Circle—Eggs are passed out in droppings, larvae develop in eggs outside body of bird. Larval egg eaten by bird, larva liberated in intestine, penetrates wall and enters blood stream. Passes through liver to lungs, penetrates blood vessel wall and enters air sac of lungs. Is coughed up, resswallowed and becomes mature on its return to intestine. Lays eggs and cycle is repeated.

Treatment—Feeding a 3 per cent tobacco containing mash for a period of about 3 weeks prior to housing of birds. Use of Merrimack Worm Control Mash and Pellets in accordance with directions on feed tag.

Prevention—Thorough sanitation with periodic cleaning of pens to break cycle of infestation.

Tapeworms:

Causative Agent—Various species of these worms.

Symptoms—Similar to round worm infestation.

Life Cycle—Eggs are passed in droppings and eaten by intermediate host such as flies, earthworms, snails, and beetles. Larva is released in intestine of host, penetrates wall, and becomes encysted in the muscle tissue. Host is consumed by bird, cyst digested, and tapeworm head liberated. Head attaches to wall of bird's intestine, matures, and lays more eggs. Each segment of worm is hermaphroditic and can reproduce a new worm.

Treatment—Unsure. Drugs are now available either in capsule, pill, or powder form which will control certain species of tapeworms. No single treatment will render birds completely free of worms. Repeat as necessary and be especially careful on sanitary precautions which will assist in their control.

Prevention—Eliminate presence of intermediate hosts. Prevent breeding of flies with use of borax, lindane or other pyrethrum fly sprays (see page 80). Keep premises free of manure piles and promptly remove accumulated droppings.

Air Sac Infection:

Causative Agent—As yet unknown, but associated with various respiratory infections. Most infectious agents carried by the blood stream can cause an exudate to cover the air sacs or membranes lining the abdominal cavity.

Symptoms—Known presence of some form of respiratory rales, coughing, wheezing or sneezing. Internal membranes covered to various de-

grees with a yellow, cheese-like exudate. May penetrate membranes and cover internal organs themselves.

Treatment—The immediate use of Merrimack Merrimycin Mash or Nibbles at full strength for three days followed by at least four more days diluted 3 to 1 with the regularly fed mash (50-gr. level). Practice better sanitation, ventilate to remove possible ammonia odors and add heat to the pens to offset the extra ventilation cooling which will occur.

Prevention—Be especially sanitary in management and care. Do not allow ammonia odors to remain in the pens. Ventilate more but add extra heat to offset cooling which may occur. True and positive cause and prevention is still unknown.

Turkey Sinusitis:

Causative Agent—Micro-organism or organisms associated with the pleuro-pneumonia group.

Symptoms—Congestion of head sinuses, swollen heads, nasal discharge, running eyes, weakness and eventual death or emaciation.

Treatment—Use of syringe and needle for removing pus accumulation from sinus. One or two injections of $\frac{1}{2}$ c.c. solution of dihydrostreptomycin sulfate containing 250 mgs. per cubic centimeter. Since these pleuro-pneumonia agents are not affected by sulfa drugs recommendations for feeding are limited to the use of antibiotics. Thus Merrimycin is recommended for assisting in the control of this infection. Since Air Sac Infection and Turkey Sinusitis have been considered to be caused by the same agent similar treatment is indicated. Aureomycin injections into each swollen sinus at the rate of 25 to 50 mgs. can also be used. Repeat in 2 or 3 days only if swelling has not subsided.

External Parasites

Lice:

Any of the forms of lice which can be easily seen on the bodies of birds, when carefully examined, can be controlled by the use of commercial louse powders, or the use of nicotine sulphate painted on the roosts just before birds retire for the evening. Every month birds in each pen should be examined for the presence of lice and, if noted, should immediately be treated to eliminate their presence.

Blue Butter, consisting of 1 part mercurial ointment and 4 parts of vaseline, may be applied in small amount directly below vent and rubbed into skin. This will control lice, but it requires individual handling.

The use of flowers of sulphur at the rate of 2 pounds per 100 square feet mixed well with the litter and repeated again in 10 days is reported successful in eliminating lice from pens where no roosts are used. If litter is wet, this treatment is not recommended.

The use of a Lindane dust using a 25 per cent wettable powder by dilution of one pound of this with 23 pounds of a suitable diluent such as talc, road dust (fine sand) or pyrophyllite will control. Two pounds of this 25 per cent wettable powder in 100 gallons of water and mist sprayed over walls, floors and other furniture will control. Do not spray into birds, water or feed.

Aramite, another reliable miticide, which may be purchased under various trade names is useful in ridding premises of mites. It is not a quick acting material but will kill mites that are present and with repeated coverage will prevent their presence. Using a 15% wettable powder add 1 ounce to 2½ gallons of water. The use of a spreader-sticker (such as used by orchardists) to the extent of ½ pint to 50 gallons of spray will increase its effectiveness. The application of 10 gallons per 24 sq. ft. pen should suffice.

Mites:

These parasites commonly attack the birds at night but leave the bird during

the day. Their usual haunts are in the cracks and crevices about the roosts, nest boxes, or waterers. The easiest method of control is to thoroughly paint these areas with Merrimack Red Mite Preventive or carbolineum once each year, just before layers are housed. Make sure this material has dried well before birds are placed in the pen.

See above recommendations for use of Lindane spray.

Autopsy Service

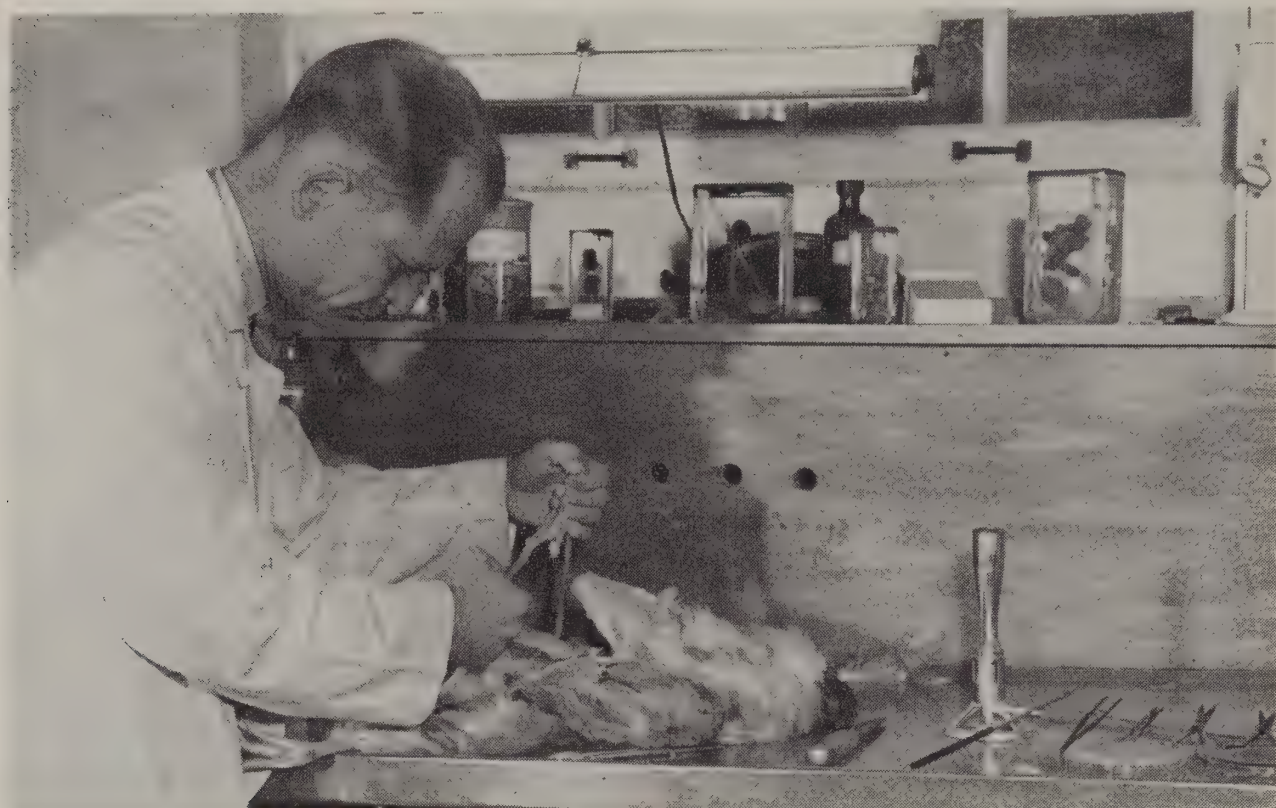
Each of our New England Agricultural Colleges maintains a trained staff to aid poultrymen of their respective States in disease problems which may be encountered. Those poultrymen who are unable to personally visit these laboratories with specimens for autopsy are urged to accompany a mailed package with a letter explaining as fully as possible the history of the disease or condition on his farm. The supply of full details will better enable the one making the autopsy to be more accurate and detailed in his return recommendations for treatment or control.

Mail or express packages prepaid so they will arrive in the middle of the week rather than over week-end.

Merrimack's poultry service men are at your call, free of charge, at any time. They will render full aid on diagnosing disease troubles and recommend treatment where possible. Merely call your nearest Merrimack store making your request for assistance.

Complete addresses for laboratory service at the nearby State institutions are as follows:

1. Poultry Pathology Laboratory
Dept. of Poultry Husbandry
University of New Hampshire
Durham, N. H.
2. Dept. of Veterinary Science
University of Massachusetts
Amherst, Massachusetts
3. Poultry Disease Laboratory
State Dept. of Agriculture
Montpelier, Vermont
4. Animal Pathologist
College of Agriculture
University of Maine
Orono, Maine



Dr. A. C. Corbett, poultry pathologist in charge of the diagnostic laboratory at the University of New Hampshire, performs an autopsy.

Permanent Bait Stations for Rat Control

“Warfarin, a recently introduced rodenticide, used in conjunction with permanent bait stations, has eliminated entire rat populations on some of the largest poultry farms. Repopulation has been prevented by continued use of the stations. One bait station per pen of birds is sufficient for most infestations.

“The drawing on page 89 gives dimensions of a bait station that has been judged the best of many designs tested. The two interior baffles protect the bait from floor litter, and provide a darkened feeding spot for the rats. The stations are placed where rats are known to run. Walls near roosting areas, feed hoppers, or water pans are generally good sites. One-half pound of the prepared bait should be placed in the center compartment. If the bait

is unmolested for more than three days, and rats are known to be in the pen, move the station to a new site. *Keep bait in the station at all times as warfarin is a cumulative poison.* Rats must eat the bait for five consecutive days for it to become effective. Ten to 14 days are usually required to remove all rats from a given building.

“A quarter pound of the warfarin .% concentrate will prepare 5 pounds of bait. A formula which has never failed to give excellent results is prepared as follows: Yellow cornmeal 48 oz.; breakfast rolled oats 20 oz., confectioners sugar 4 oz.; corn oil 4 oz.; and .5% warfarin concentrate 4 oz. Weigh the materials accurately and mix thoroughly before using. Label storage container in order to prevent misuse of the material.” John A. Ludeman, U. S. Fish & Wildlife Service, Durham, New Hampshire.

Merrimack Services

Wholesale Division

The purchase of all feed ingredients required by the Milling Department of the Exchange for use in the mixing of the high quality Merrimack Brand feeds is the function of the Wholesale Division. Thorough knowledge of the business and familiarity with the trade personnel aids the Wholesale Division in procuring best buys at all times. Large feeders in our territory often purchase straight carloads of certain single ingredients direct through this office on the Grain and Flour Exchange at Boston. These feeders have at their service an experienced staff for direct wholesale purchases as their needs demand.

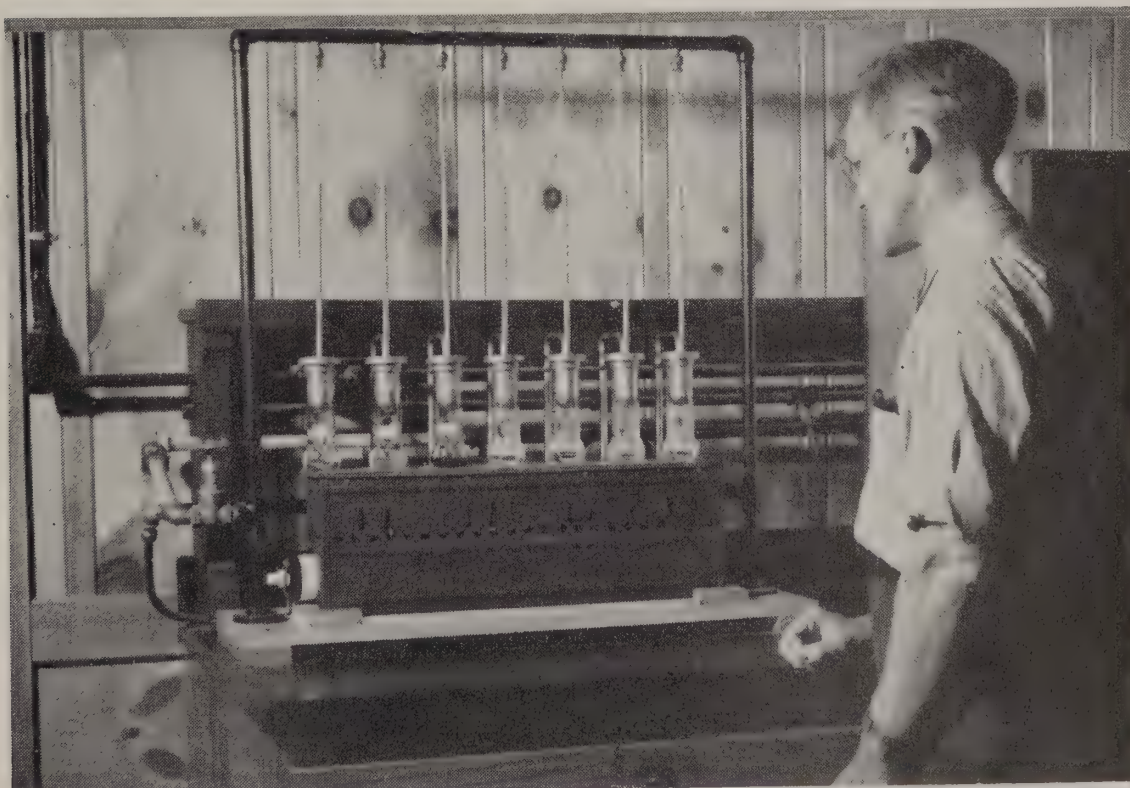
Milling Department

At Bow, N. H., Merrimack owns and operates one of the most modern feed mills in New England. All ingredients, bagged or bulk, enter daily and are completely balanced and mixed to provide fresh, nutritious poultry,

dairy, and livestock rations which the majority of New Hampshire farmers purchase and use as Merrimack Feeds — “Made Today and Fed Tomorrow.” The Exchange also has one of the few grist mills operating in the state where the farmers can send in home-grown grains for grinding at a minimum of cost. A small, branch mill is also being operated at Epping as needed.

Retail Department

This branch of the Exchange operates the distribution system so essential in providing dependable service to New Hampshire farmers. In addition to the steady flow of Merrimack Rations through the 23 branch stores, the retail program makes available hundreds of commodities needed for farm production. Retail stores are located in Bradford, Claremont, Concord, Derry, Epping, Epsom, Exeter, Franklin, Goffstown, Henniker, Keene, Laconia, Manchester, Milford, Nashua, New Boston, Ossipee, Peterborough,



Fat analysis progressing at Merrimack's Feed Control Laboratory.

Pittsfield, Plymouth, Rochester, Warner, and Woodsville.

“The Farmer’s Business”

The Merrimack Farmers’ Exchange, owned by New Hampshire farmers and operated by farmer directors of their choosing, justifies its existence by the record it has made in supplying

quality merchandise, efficient service, and substantial savings to its patrons.

Production and distribution of high quality rations for poultry and livestock is the cornerstone upon which “The Farmer’s Business” has been built. Thousands of New Hampshire farmers have learned that it pays to feed Merrimack Rations.

General Information

1. Proper dilution for Merrimack 4-Plus disinfectant: 1 part to 80 parts water.
2. To assist in preventing concrete from freezing, use 2 pounds of calcium chloride per bag of cement, plus heated ingredients.
3. Three hundred mature laying birds will consume about one bag of feed per day.
4. How to figure steel roofing requirements:

Corrugated roofing of 2½" corrugations should be lapped at each joint by two corrugations. Since these sheets are normally 26" wide a loss of about 12½ per cent of the width of sheets will thus occur. Hence, compute the surface to be covered and add ⅛. An allowance of about 6" also must be made for end laps.

5. Weights and Measures:

a. AVOIRDUPOIS WEIGHTS:

16 drams	equal	1 ounce
16 ounces	"	1 pound
100 pounds	"	1 bag feed or 1 cwt.
20 cwt.	"	1 ton
2000 pounds	"	1 ton
2240 pounds	"	1 long ton

b. DRY MEASURE:

2 pints	equal	1 quart	equal	1.3 lbs.
				mash (approx.)
8 quarts	"	1 peck		
4 pecks	"	1 bushel		

c. LINEAR MEASURE:

12 inches	equal	1 foot
3 feet	"	1 yard
5½ yards	"	1 rod
320 rods	"	1 mile

d. SQUARE MEASURE:

144 square inches	equal	1 square foot
9 square feet	"	1 square yard
160 square rods	"	1 acre
640 acres	"	1 square mile

e. LAND MEASURE:

60 feet by 726 feet	equal	1 acre
220 feet by 198 feet	"	1 acre
43,560 square feet	"	1 acre
40 yards by 121 yards	"	1 acre
4 rods by 40 rods	"	1 acre

f. CUBIC MEASURE:

1728 cubic inches	equal	1 cubic foot
27 cubic feet	"	1 cubic yard
128 cubic feet	"	1 cord

g. MISCELLANEOUS USEFUL MEASURE:

40-50 drops	equal	1 teaspoon
3 teaspoons	"	1 tablespoon
2 tablespoons	"	1 fluid ounce
16 tablespoons	"	1 cup
2 cups	"	1 pint

h. BARREL EQUIVALENTS (Variable):

3 bushels apples	equal	1 barrel
200 pounds beef	"	1 barrel
4 bags cement	"	1 barrel
196 pounds flour	"	1 barrel
55 gallons gasoline	"	1 barrel
320 pounds lime	"	1 barrel
650 pounds molasses	"	1 barrel

CONVERSION EQUIVALENTS*:

Volume

1 quart	equal	32 fluid ounces	equal	
57.75 cubic in.	equal	.946333 liter.		
1 quart	equal	256 fluid drams	equal	
15360 minims.				
1 liter	equal	1.05671 liquid quart		
equal		1.8162 dry pints		
1 liter	equal	270.518 fluid drams		
equal		33.8147 fluid ounces.		
1 dry quart	equal	67.200625 cubic in.	equal	1.101198 liters.
1 cubic inch	equal	16.387 cubic centimeters.		
1 cubic centimeter	equal	.0610 cubic inch.		
1 fluid ounce	equal	1.80469 cubic inches.		
1 gallon water at 15°	weighs	8.337 pounds or 3.782 kilograms.		
1 tablespoon	equal	16 cc	equal	.976 cu. in.
				equal .54 fluid oz.

Area

1 square inch	equal	6.452 square centimeters.
1 square centimeter	equal	.154999 square inches.

Length

1 inch	equal	.08333 feet	equal	
2.54001 centimeters	equal	72 points (printers).		
1 centimeter	equal	.393700 inches.		

Weight

1 pound av.	equal:	
16 ounces av.	equal	256 drams av.
7000 grains	equal	453.5924 grams.
27.692 cu. in. water at 4° C.		.4535924 kilograms.
1 ounce av.	equal:	
.0625 lbs.	equal	16 drams av.
437.5 grains	equal	28.349527 gms.
.9114583 Troy oz.	equal	18.22917 pennyweights.

* U. S. Industrial Chemicals Co., New York 5, N. Y.

- 1 gram equal:
.771618 scruple equal .2572059 dram apoth.
.03215074 ounce apoth. equal
.64301 pennyweight.
.03527396 ounce av. equal .03215 ounce Troy.
.5643833 dram av. equal 15.432356 grains.

1 Troy pound equal:
.822857 av. lb. equal 13.1657 av. ounces.
12 Troy ounces equal 240 pennyweight.
5760 grain equal 373.24177 grams.

1 Troy ounce equal 1.09712 av. ozs.

1 kilogram equal:
2.2046223 pounds av.
2.6792285 pounds Troy.
35.273957 ounces av.
32.150742 ounces Troy.
564.38 dram av.
257.21 dram Troy.

Pressure
One pound per sq. inch equal
.070302 kg. per sq. cm.
One kilogram per sq. cm. equal
14.2235 pounds per sq. in.

i. MERRIMACK FEED MEASURE:
1 quart All Mash equals 1 1/3 lbs.
1 quart All Mash Pellets equals 1 3/4 lbs.

j. 1 U. S. Gallon of fresh water weighs 8.33 pounds.

k. Tank capacity—in gallons for any cylindrical tank or cistern, square the diameter (in feet) multiply by 5.875. Multiply this by the height in feet. In cubic feet, 3.146 x radius in feet squared x height in feet.

l. Doubling a pipe diameter quadruples its capacity.

6. To measure grain bin capacity in bushels, determine inside cubic measure in feet, divide by 5, and multiply by 4.

6a. To determine shelled grain weight in bin: Determine cubic contents and subtract 20% equals bushels.

Bushels x 1.25	equal cu. ft.
Bushel, Corn	" 56 lbs.
Bushel, Oats	" 32 lbs.
Bushel, Wheat	" 60 lbs.
Bushel, Barley	" 48 lbs.

7. To fumigate 10 cubic feet of incubator space, use 1 teaspoonful of formalin and 1/2 teaspoon of potassium permanganate.

8. Approximate dressing loss for chickens and turkeys:

	Chickens (Per Cent)	Turkeys (Per Cent)
Blood	4.36	4.25
Feathers	8.00	6.00
Intestines	8.50	8.00
Head and Feet	7.00	6.00
Bones of Body	7.00	7.00
	34.86	31.25
Total Dressing Loss	12	10
Total Dressing and Drawing Loss	28	25

9. Head Wrapper Measurements:

These can be made of parchment paper using rectangular papers of the following sizes:

- Broiler 6" x 12"
- Fowl 7" x 14"
- Turkey 9" x 18"

To complete, cut off one corner of rectangle so the three remaining sides measure:

- Broiler 6" x 6" x 12"
- Fowl 7" x 7" x 14"
- Turkey 9" x 9" x 18"

10. To prevent flies from breeding on manure piles:

- a. Apply evenly over pile 1 pound of borax per 16 to 20 cubic feet of manure.
- b. Sprinkle same quantity of manure with solution of 2 pounds of copperas (ferrous sulphate) per gallon water, or
- c. Sprinkle with solution of 1 pound hellebore in 20 gallons of water.
- d. A very tightly compressed, smooth top on manure pile will generate sufficient heat below surface to largely destroy the fly larvae.

11. Lime or CaO is a cheap disinfectant when used as slaked or chlorinated lime. When CaCO₃ is heated, CaO is produced which when treated with water produces Ca (OH)₂ or slaked lime. If slaked lime is exposed to air for a few days it absorbs CO₂ and reverts to the inert form of CaCO₃. Two pounds calcinated lime CaO mixed with one pint of water forms Ca (OH)₂ or slaked lime.

12. To estimate hay tonnage in mow:
Compute cubic contents and divide by 500, equals tons. Note: Hays will vary in weight and bottom of large mow weighs more than top average of 450-500 cu. ft. per ton. To determine straw weight divide by 1200.

13. One hundred pound bag of feed will measure approximately 3 cu. ft. Thus, figure a minimum actual cubic capacity per ton of 60 cu. ft. for bulk feed. When building bins allow for a 30% extra capacity.
14. Brown or red coloration of bones of frozen broilers or poultry is caused by freezing and thawing bringing the hemoglobin in the bones to the surface. This shows up as red or brown particularly in bones of the younger birds. It is perfectly normal and has no effect on the flesh.

15. To determine the approximate weight of fresh droppings produced per bird for any period multiply 1.7 times the pounds of feed consumed.

PERIODS OF INCUBATION			
Kind of Poultry	Days		
Hen	21	Pheasant	22-23
Duck	28	Peafowl	28
Turkey	28	Guinea	26-28
Duck (Muscovy)	33-35	Goose	30
		Pigeon	17

CONVERSION FACTORS			
Multiply	by	To Determine	
Diameter of circle	3.1416	circumference of circle	
Diameter of circle	0.886	side of equal square	
U. S. gallons	0.1337	cubic feet	
Cubic feet	62.428	pounds of water	
Centigrade degrees equal 5/9 (Fahrenheit degrees - 32°).			
Fahrenheit degrees equal 9/5 (Centigrade degrees + 32°).			
12 cubic feet equals 1 bale peat equals coverage of 80 square feet 3 inches deep.			
1 hen will produce nearly 100 lbs. droppings per year at 70% moisture.			
1 cubic foot of chestnut size hard coal weighs about 56 pounds, hence 36 cubic feet of space will hold one ton.			

- APPROXIMATE VALUES
1. To determine number of pullets required to fill houses — divide square feet of total floor space including space taken by dropping pits by 3.5.

2. To determine number of broilers desired for sale — multiply number desired by 1.15 (to cover mortality and culling) equals number of chicks to start.

3. To determine brooders required — each 350 chicks equals 1 brood unit equals 1 brooder.

4. Daily requirement of fuel — 18 to 22 pounds of coal, 4 kw. electricity, 2.0 to 2.5 gal. oil, 3 to 4 pounds gas.

5. Feed required to produce 12-week chicken broilers equals 12 lbs.
Feed required to produce 12-week turkey broilers equals 14 lbs.

6. Daily requirement of water per 100 layers equals 6 to 8 gallons.

QUALITY EGG FORMULA 5 TO 6 PLUS 7 TO 8

50- to 60-degree holding temperature plus

70- to 80-per cent relative humidity in holding room.

ROUGH ESTIMATE OF FEED REQUIREMENTS PER 100 CHICKS

Up to 4 weeks of age, take age in weeks and add one, which equals feed required daily.

At all other ages up to 5 months maximum, take 1½ times the age in weeks to determine the pounds of feed required daily.

COST OF RAISING PULLETS

Based on results of a Cornell study in 1947 the following formulas were set up for poultrymen who wished to figure the average net cost of raising pullets.

		Sexed Leghorns		Sexed Heavy Breeds	
Feed:	Price per pound	x	25 Pounds		34 Pounds
Labor:	Value per minute	x	32 Minutes		33 Minutes
Chicks:	Price per chick	x	1.1		1.1
Other Items:	To total cost of above three		Add 15%		Add 10%

SPACE REQUIRED FOR BULK FEEDS*

Approximate Weights of Various Feeds:

Fast-Gro Broiler and other High Efficiency Diets	40 lbs. per cu. ft.
All Mash and other conventional poultry feeds	35 lbs. per cu. ft.
Dairy Feeds	25 lbs. per cu. ft.
Hard grains and pellets	42 lbs. per cu. ft.

Example: Suppose your poultry feed requirements average 5000 lbs. for a one week period. Suppose also that the floor space available for a bulk feed bin is 5'x5'. Referring to the table we find that a 5'x5'x1' space (all figures given are at rating of 1' height) will hold 1000 lbs. of Fast-Gro Starter and Broiler Feed. Since you require 5000 lbs. these bins should be 5' minimum height and preferably 7' to allow for ease in filling and assurance of carry over to next delivery.

<i>Space Needed (cu. ft.)</i>	<i>Fast-Gro Broiler</i>	<i>All Mash etc.</i>	<i>Dairy Feeds</i>	<i>Hard Grains and Pellets</i>
4x 4x1	640	560	400	672
4x 5x1	800	700	500	840
4x 6x1	960	840	600	1008
4x 7x1	1120	980	700	1176
4x 8x1	1280	1120	800	1344
5x 5x1	1000	875	625	1050
5x 6x1	1200	1050	750	1260
5x 7x1	1400	1225	875	1470
5x 8x1	1600	1400	1000	1680
6x 7x1	1680	1470	1050	1764
6x 8x1	1920	1680	1200	2016
6x 9x1	2160	1890	1350	2265
6x10x1	2400	2100	1500	2520

* Adapted from data of Baughman Mfg. Co.

Budget for Table Egg Flock — 1950*

One man unit 2000 birds housed, 1600 ave. number

STANDARDS	
Labor Efficiency:	2000 layers housed (1600 ave. for year). 2200 pullet chicks brooded.
Production:	173 eggs (14.4 doz.) per hen housed. 216 eggs (18 doz.) per ave. number layers (60% rate lay).
Mortality:	5% growing flock. 15% laying flock.
Capacity Use Bldgs.:	Average number layers 80% of housing capacity.
Feed Consumption:	Growing Stock: 30 lbs. to 24 weeks of age. Layers: 124 lbs. per bird for year based on average number of birds or 34 lbs. daily per 100 hens.

ESTIMATED PRICES	
Average price eggs —	48c doz.
Average price fowl —	22c per lb.
Average price feed —	\$4.00 per cwt.

INVESTMENT	
Investment Poultry Buildings @ \$4.00 per bird	\$8000
Depreciation rate 5%	
Investment in Equipment @ 75c a bird	1500
Depreciation rate 10%	

EXPENSES	
Growing Flock: 2200 pullet chicks @ 26c	\$572
630 cwt. feed @ \$4.00	2520
Other cash costs	220
	\$3312
Laying Flock: Feed — 1985 cwt. @ \$4.00	\$7940
Supplies, etc.	500
	8440
Overhead: Depreciation Buildings, \$8000.00 @ 5%	\$400
Depreciation Equipment, \$1500.00 @ 10%	150
Taxes	250
	800
Total Expenses	\$12,552

RECEIPTS	
Cull pullets 100 birds, 400 lbs. @ 24c	\$96
Eggs sold 28,800 doz. @ 48c	13,824
Fowl sold 1700 birds @ 6½ lb., 11,050 lbs @ 22c	2431
	16,351
	\$3799
Per hen housed	\$1.85
Per average number of layers	\$2.37

EFFECT RATE OF LAY ON LABOR RETURNS	
Rate of Lay	Egg Income
40% (144 eggs or 12 doz. per bird)	\$9216
43% (156 " " 13 " " ")	9984
46% (168 " " 14 " " ")	10,752
50% (180 " " 15 " " ")	11,520
53% (192 " " 16 " " ")	12,288
56% (204 " " 17 " " ")	13,056
60% (216 " " 18 " " ")	13,824
	Labor Return
	\$—809
	— 41
	727
	1495
	2263
	3031
	3799

NOTE: For every 1 dozen eggs more per hen or 3 to 4% rise in rate of lay, labor return increases by \$768.

* Suggested by Extension Service, College of Agriculture, University of Maine.

Budget for the Hatching Egg Flock — 1950*

One man unit 2000 birds housed, 1600 ave. number

STANDARDS

Labor Efficiency:	2000 birds housed (1850 pullets + 150 ckl.). 1600 birds ave. for year (1480 pullets + 120 ckl.). 2400 chicks brooded (2100 pullets + 300 ckl.).
Production:	144 eggs (12 doz.) per hen housed. 180 eggs (15 doz.) per hen based on ave. number (50% rate lay).
Mortality:	5% growing flock. 15% laying flock.
Capacity Use Bldgs.:	Average number layers 80% of number housed.
Feed Consumption:	Growing Pullets: 30 lbs. to 24 weeks. Growing Cockerels: 45 lbs. to 26 weeks. Layers and cockerels in breeding pens: 124 lbs. per bird for year based on average number, or 34 lb. daily per 100 birds.
Hatching Egg Sales:	75% of total eggs produced sold as hatching eggs.

ESTIMATED PRICES

Average price table eggs sold, 43c.
Average price hatching eggs, 73c.
Average premium over Boston market egg price, 25c.
Average price fowl, 21c.
Average price cockerels, 15c.
Average price stags, 18c.
Average price growing mash, \$4.00 cwt.
Average price breeder mash, \$4.10 cwt.

INVESTMENT

Investment Poultry Buildings @ \$4.00 per bird	\$8000 (Dep. rate 5%)
Investment Poultry Equipment @ 75c per bird	1500 (Dep. rate 10%)

EXPENSES

Growing Flock: 2100 pullet chicks @ 26c	\$546	
300 cockerel chicks @ 15c	45	
600 cwt. feed pullets @ \$4.00	2400	
122 cwt. feed cockerels @ \$4.00	488	
Other cash costs	230	
		\$3709
Laying Flock: Feed 1985 cwt. @ \$4.10	\$8138	
Supplies, etc.	500	
Testing 2000 @ 6c	120	
		8758
Overhead: Depreciation Buildings \$8000 @ 5%	\$400	
Depreciation Equipment, \$1500 @ 10%	150	
Taxes	250	
		800
Total Expenses		\$13,267

RECEIPTS

Cull pullets, 145 birds, 580 lbs. @ 24c	\$139
Surplus cockerels, 135 birds, 945 lbs. @ 18c	170
Table eggs sold, 5550 doz. @ 43c	2386
Hatching eggs sold, 16,650 doz. @ 73c	12,155
Fowl sold, 1572 birds, 10,218 lb. @ 21c	2146
Cockerel birds sold, 127 birds, 1016 lbs. @ 15c	152
Total Receipts	\$17,148
Net Labor Return	\$3881
Per bird housed, \$1.94; Per average number birds, \$2.42.	

* Suggested by Extension Service, College of Agriculture, University of Maine.

EFFECT RATE OF LAY ON LABOR RETURNS

(Assuming 75% of eggs are sold as hatching eggs)

Rate of Lay						Egg Income	Labor Return
40%	(144	eggs,	12	doz.	per bird)	\$11,633	\$971
43%	(156	"	13	"	" "	12,602	1942
46%	(168	"	14	"	" "	13,571	2911
50%	(180	"	15	"	" "	14,541	3881
53%	(192	"	16	"	" "	15,510	4850
56%	(204	"	17	"	" "	16,482	5822

NOTE: Labor return increases about \$970 for every increase of 3 to 4% in rate of lay.

EFFECT PROPORTION OF EGGS SOLD AS HATCHING EGGS ON LABOR RETURN

(Assuming 50% average rate of lay)

Per Cent Eggs Sold as Hatching Eggs	Egg Income	Labor Return
40%	\$12,260	\$1600
45%	12,547	1887
50%	12,876	2216
55%	13,209	2549
60%	13,542	2882
65%	13,875	3215
70%	14,208	3548
75%	14,541	3881

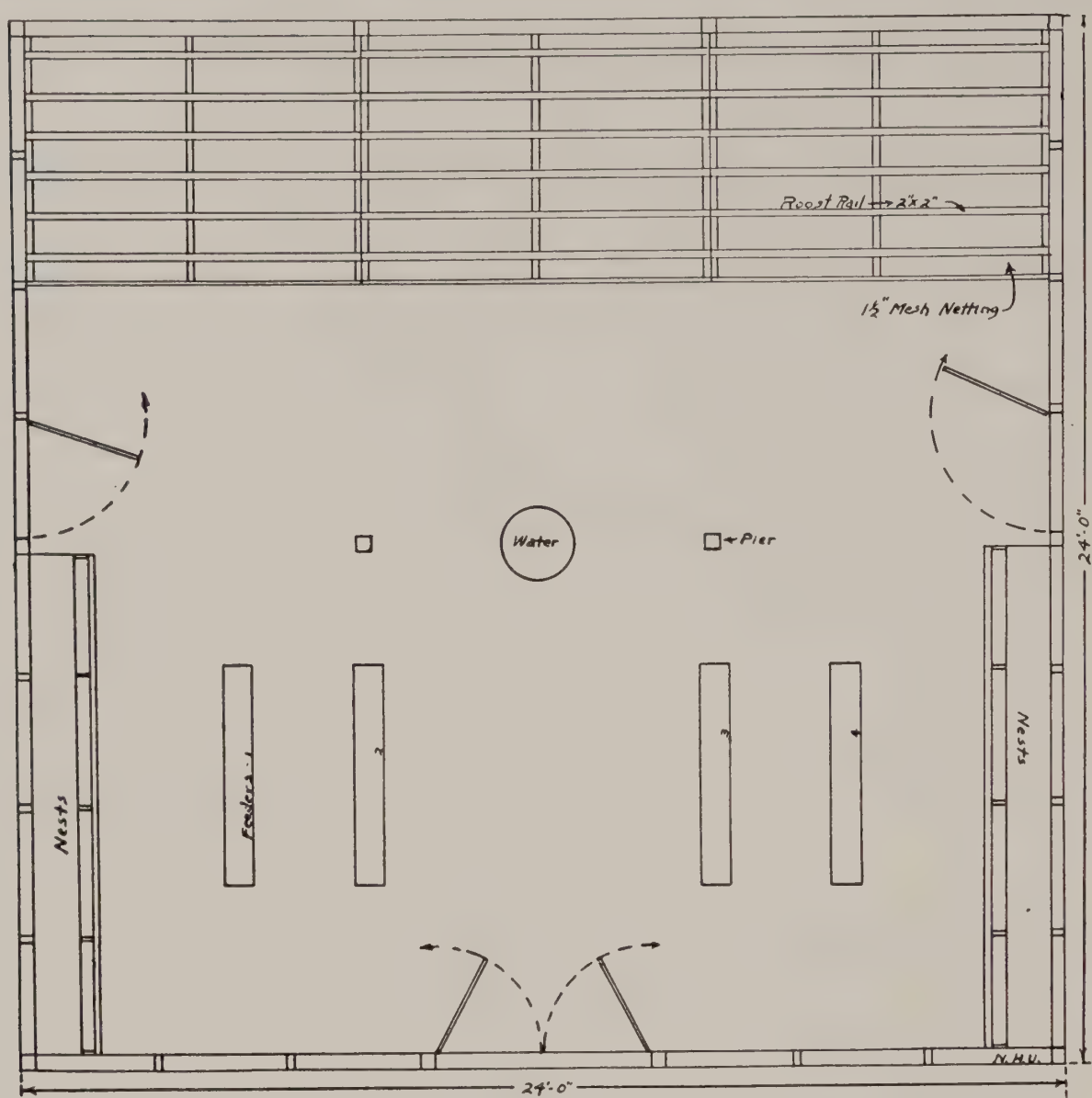


FIGURE 3. General floor plan of U. N. H. laying shelter.

The U. N. H. Laying Shelter*

The shelter is designed for construction on a concrete foundation with provision for a concrete apron 4" thick underneath the roosting quarters. To facilitate cleaning of this area without going inside the shelter, a hinged rear section is provided. The rear sill is embedded in the wall so that a completely flat surface exists over wall and apron eliminating any obstruction to easy cleaning.

To construct this shelter on posts rather than concrete foundation, the sills should be of 4" x 4" material rather than the 2" x 4" material shown in the plan. Posts should preferably be spaced every six feet. Sills should be

anchored to foundation wall or posts. The plan calls for the use of 10-inch bolts embedded in the foundation, which will pass through the 2" x 4" sill to anchor the shelter.

Three doors are provided for this shelter, one double front door and two smaller doors, one on either side. Thus, it is possible to place the shelter so that a fence line intersects the center point between the two front doors, and the other fence line joins with the rear line of the shelter. By a continued fence line enclosure two range areas may be formed and used alternately, each range area being provided with two exit doors from the shelter. Such a

* This material is adapted from Circular 244, Extension Service, University of New Hampshire. Used by permission.

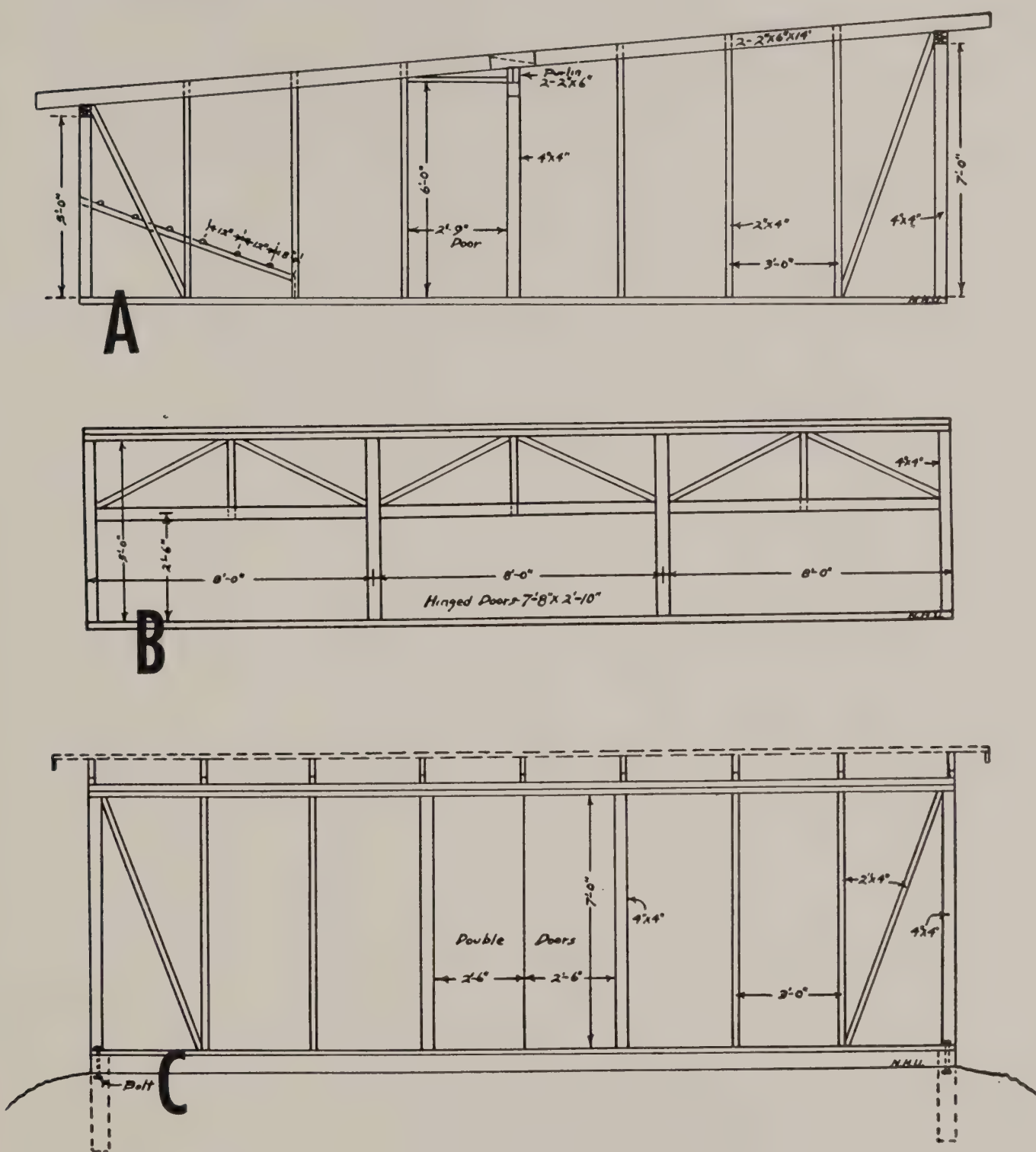


FIGURE 4. A, end framing detail. B, rear framing detail. C, front framing detail.

system of operation will allow greater opportunity for the maintenance of a good green grass range. All doors are wire covered.

The plans shown call for the use of two 2" x 6" x 14" boards overlapped above the purlin approximately 15" for the internal rafters. This will provide an extension of 15" beyond front and rear plates. The two outermost rafters, one on either side, should be mortised together to provide a smooth surface throughout their entire length.

Although this shelter is primarily designed for use only during the summer and fall periods, by the provision of waterproof plywood, asbestos board, or other suitable siding it can be converted for use during the winter period. The house has sufficient head room provided for year round usage. While a lower studded house would be more economical to construct, it would be less convenient for the attendant in his routine care of birds so confined.

BILL OF MATERIALS

LUMBER:

<i>Item</i>	<i>Size</i>	<i>No. Pieces</i>	<i>Board Feet</i>
Sills	2"x4"-12'	8	64
Plates	2"x4"-12'	4	32
	2"x4"-10'	2	13 1/3
	2"x4"-14'	2	18 2/3
Purlin	2"x6"- 8'	6	48
Posts (Purlin)	4"x4"-12'	1	16
	4"x4"-14'*	1	18 2/3
* 2 - 4"x4"x12" used for purlin caps			
Rear Studding	4"x4"-10'	2	26 2/3
Front Studding	4"x4"-14'	2	37 1/3
	2"x4"-14'	2	18 2/3
Side Studding	2"x4"-14'	5	46 2/3
	2"x4"-12'	1	8
Rafters	2"x6"-14'	18	252
Rafter Trim	1"x4"-14'	4	18 2/3
Facia	1"x4"-14'	4	18 2/3
Rear Bracing	2"x4"- 8'	4	21 1/3
	2"x4"-10'	3	20
Side Bracing	2"x4"-14'	2	18 2/3
Front Bracing	2"x4"-16'	1	10 2/3
Roofers	1"x8"-12' T&G		900
Front Doors	1"x4"-14'	4	18 2/3
Side Doors (Optional)	1"x4"-12'	4	16
Roosts and Roost Rails	1"x10"-8'	3	20
	2"x2"- 8'	18	48
	2"x4"-14'	5	46 2/3
Rear Door for Dropping Pit	1"x4"-12'	6	24
			1781 1/3

HARDWARE:

- 2 sets regular garage door fasteners with head and base plates.
- 1 hasp and lock—front door.
- 3 pair 4" T hinges with screws—front doors.
- 2 pair 4" T hinges (optional for side door).
- 2 hasps with locks (optional for side doors).
- 3 pair 4" T hinges with screws—dropping pit doors.
- 3 pair 6" T hinges with screws—roosts.
- 3 - 3" screw hooks and eyes—dropping pit door supports.
- 6 turn buttons with screws—dropping pit door fasteners.
- 16 - 10" galv. bolts with nuts and washers.
- 7 rolls three-ply roofing.
- 1 - 150' roll 19 gauge 1" mesh galv. poultry netting 5 ft. wide.
- 24 ft. 16 gauge 1 1/2" mesh galv. poultry netting 6 ft. wide or 1"x2" mesh welded wire 6 ft. wide.
- 5 pounds poultry wire staples.
- 25 pounds 8 penny common nails.
- 10 pounds 10 penny common nails.
- 10 pounds 20 penny common nails.

CONCRETE WORK:

Foundation walls (1:2¾:4 mix) 4 1/3 cu. yds. concrete (approx.)
Cement — 22 sacks
Sand — 2½ cu. yards
Gravel — 3¼ cu. yards

Droppings Pit Slab (1:2¼:3 mix) 4" thick 1¾ cu. yards concrete
Cement — 11 sacks
Sand — 1¼ cu. yards
Gravel — 1½ cu. yards

Recommended Mix

	Gals. Water Per sack cement with average moist sand*	Cu. Ft. Sand per sack of cement	Cu. Ft. Gravel per sack of cement
1: 2¼:3	5	2¼	3
1: 2¾:4	5½	2¾	4

* Adjust slightly according to wetness or dryness of sand used in order to get an easily worked mix. Too much water means a weak, porous concrete.

POST FOUNDATIONS: (1: 2¾:4 mix) 3 cu. ft. each (approx.)
Cement — 1 sack
Sand — 2¾ cu. ft.
Gravel — 4 cu. ft.

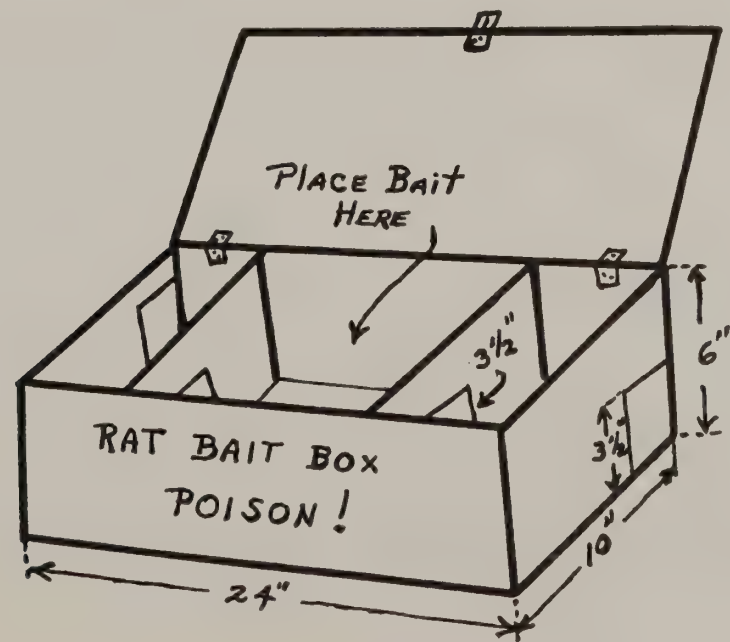


FIGURE 5. A practical rat-bait station. See page 76.

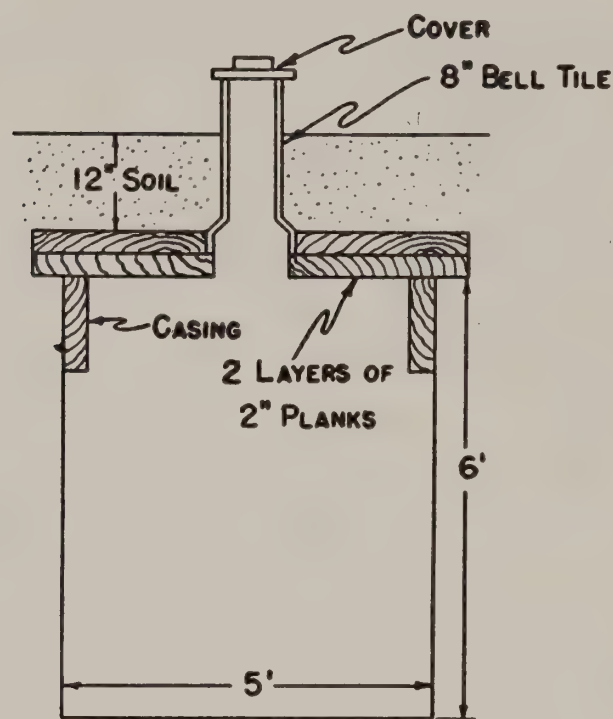


FIGURE 6. Disposal pit. From Maine Extension Bulletin 399.

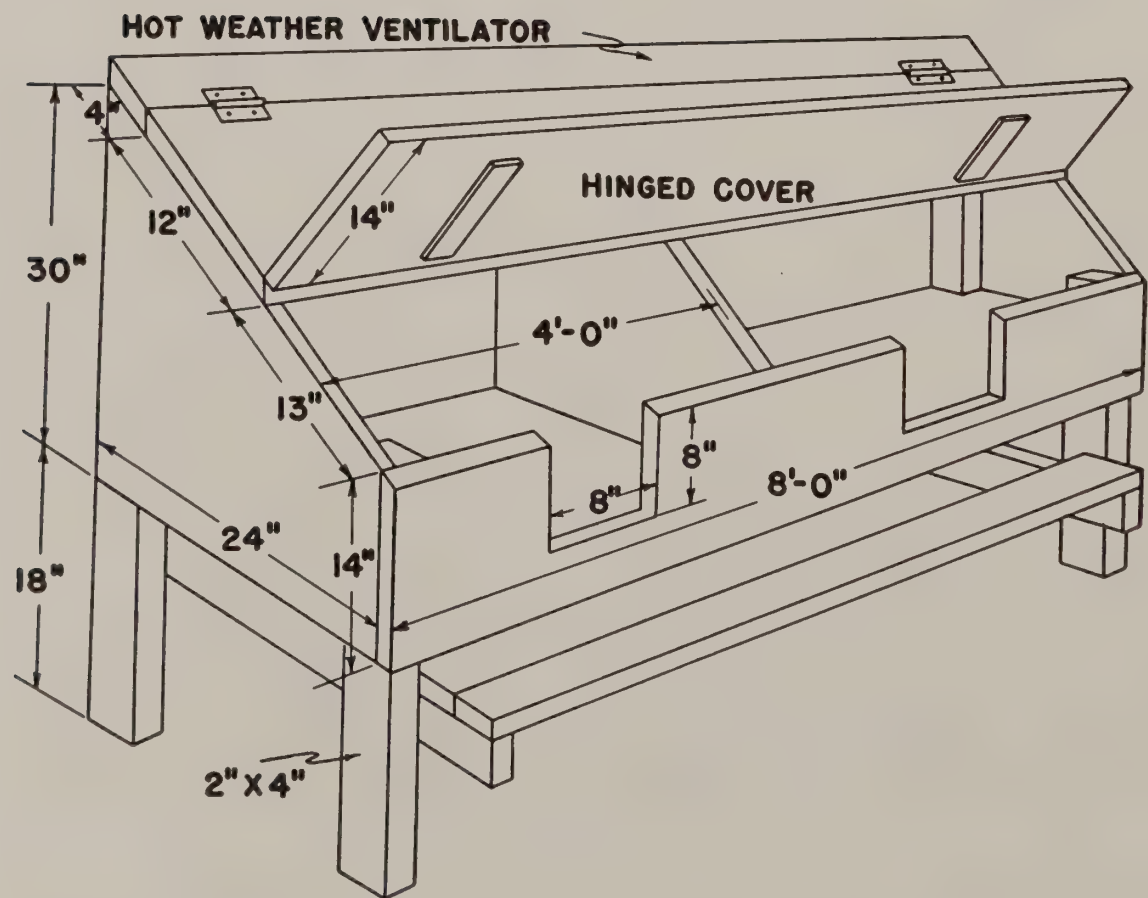
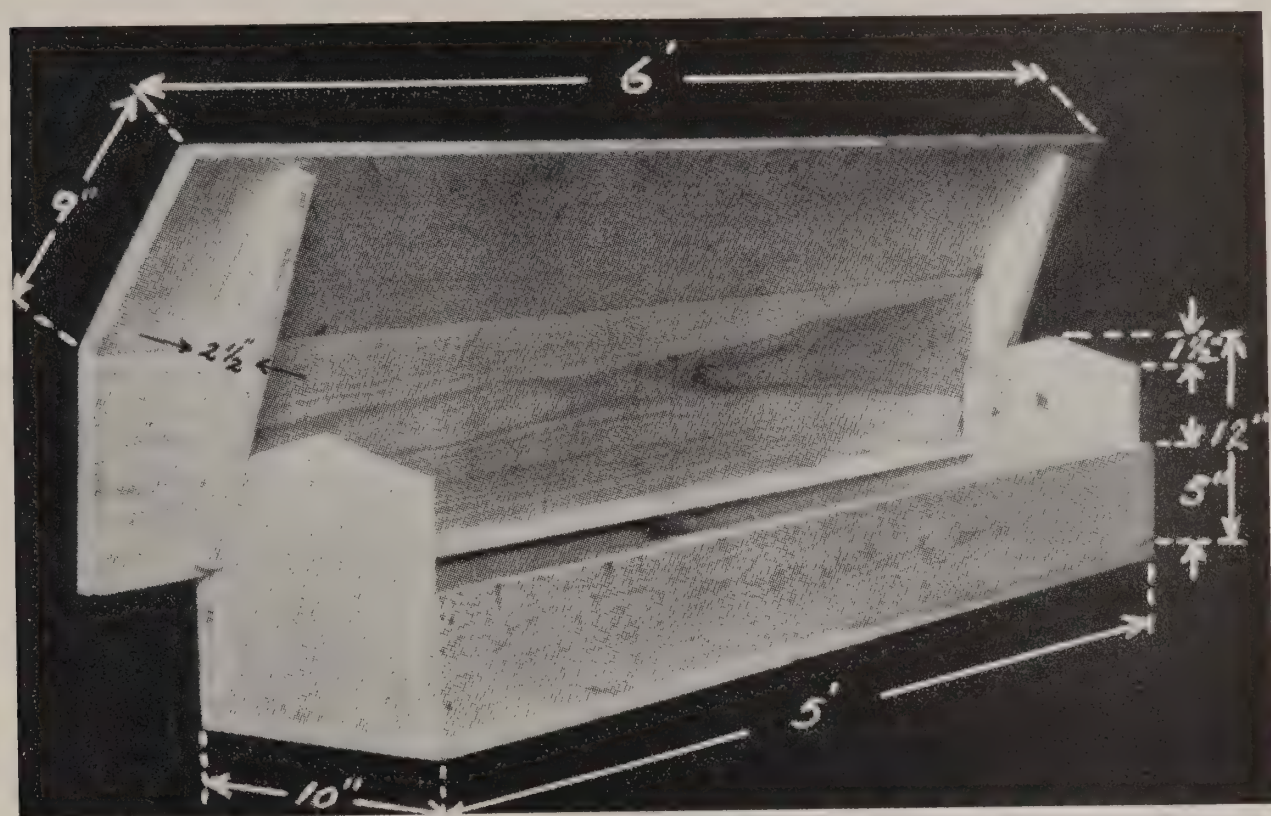


FIGURE 7. Massachusetts clean egg nest. From Maine Extension Bulletin 399

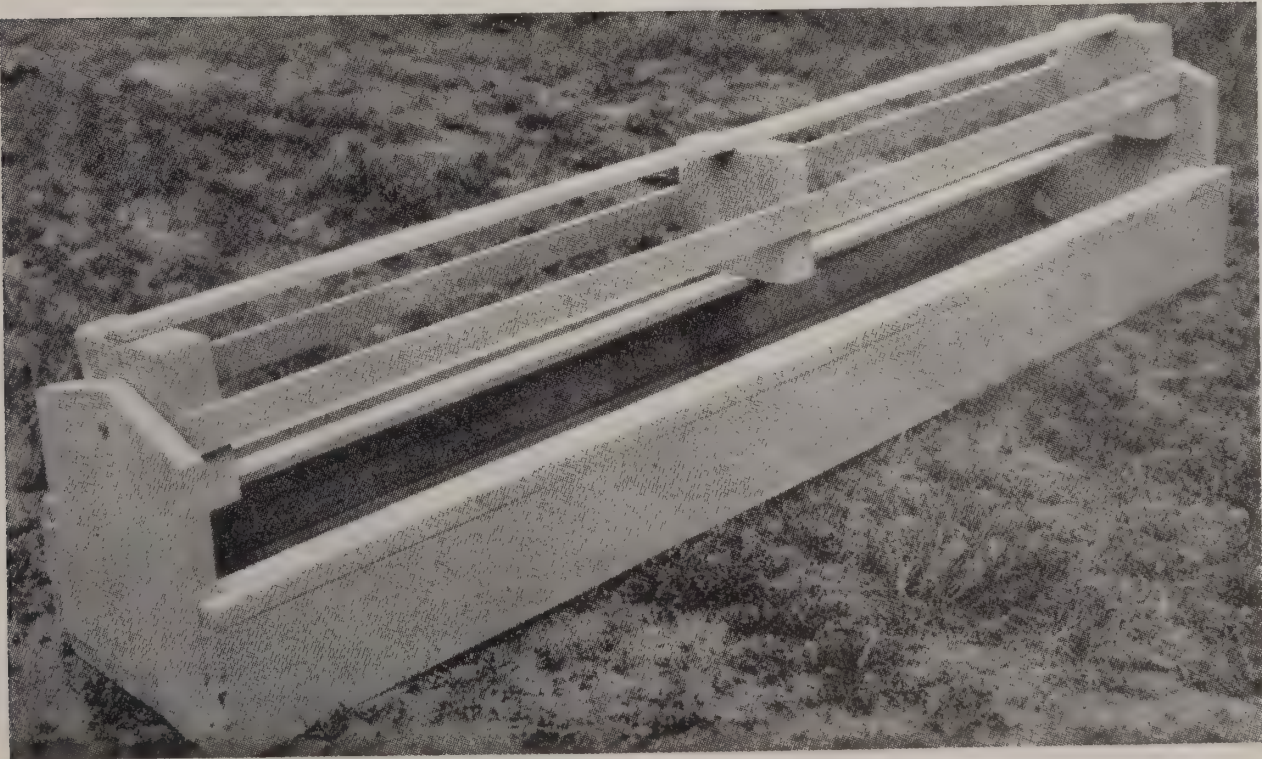


U. N. H. Photo.

Five-foot range feeder with hinged top.

Below, same feeder adapted for use in the poultry house.

U. N. H. Photo.



MERRIMACK POULTRY FEEDS

Balanced Rations for Specific Purposes

1 — Merrimack Fast-Gro Starter and Broiler Ration*:

A complete high energy ration for use in starting replacement birds and for highest efficiency in the nutrition of top grade broilers, roasters and capons. The ration is available in mash, nibble or pellet form. For replacement birds feed from day old up to eight weeks of age; for the meat birds it can be used as the sole and complete diet up to marketing.

2 — Merrimack Complete Grower*:

This is a conventional type ration, fully complete in its composition for use from eight weeks of age up to maturity. Available in mash or pellet form.

3 — Merrimack Hi-F Grower*:

A complete, nutritionally balanced growing feed of the high efficiency type. For use over the feeding period of eight weeks to maturity. Carrying a very low level of fibre, less feed is required per unit of growth, thus making for higher efficiency than in No. 2 above. Available in mash or pellet form.

4 — Merrimack Growing Ration:

This ration is formulated for regular use with hard grains or scratch. From eight weeks, when changing to this ration, intermediate or regular size scratch feed should be used along with this mash to the extent of about 40 per cent. Available in mash or pellet form.

5 — Merrimack Laying Mash:

A follow-up ration to be used after Merrimack Growing Ration and at time of first egg. Furnishes full nutritional requirements for high market egg production when supple-

mented with Merrimack Scratch Feed, calcium supplement and grit. Available in mash or pellet form.

6 — Merrimack Complete Layer:

A fully fortified and complete laying ration which needs and preferably should have no supplementation with hard grains or scratch. A follow-up ration to Complete Grower used from time of production start. Available in mash or pellet form.

7 — Merrimack Hi-F Layer:

A companion feed to Hi-F Grower which should follow in use after birds reach the start of egg production. A high efficiency, complete market egg production diet. Should not be supplemented with hard grains or scratch feed. Do supplement with oyster shells, calcite crystals or Lime-roll. Available in mash or pellet form.

8 — Merrimack All Mash*:

This is a complete mash which does everything . . . starts chicks . . . grows the pullets . . . keeps layers in production . . . and builds high hatchability. No hard grains are used with this mash. A conventional type mash — not necessarily high efficiency type, but is the largest selling mash in our territory. Available in mash or pellet form.

9 — Merrimack Super Mash:

A relatively new, complete breeder ration of the high efficiency type requiring less feed to produce at high rates of production with splendid hatchability. Not to be supplemented with hard grains. Available in mash or pellet form.

* These feeds are available with or without 0.0175 per cent sulfaquinoxaline for use in the prevention of coccidiosis.

10 — Merrimack Breeder Mash:

For the producer of hatching eggs who wants assurance of premium hatchability with grain and mash feeding program. This ration is designed for use with hard grains. Start feeding when birds reach sexual maturity. Available in mash or pellet form.

11 — Merrimack Turkey Starter:

A complete feed of 24 per cent protein content for the starting and growing of turkey poults up to eight weeks of age. Needs no supplementation except possibly the provision of grit for increased efficiency of food utilization. Available in mash, nibble or pellet form.

12—Merrimack Turkey Growing Mash:

A 20 per cent protein content mash for use from eight weeks of age up to maturity or marketing. Use hard grain, corn or scratch to supplement. Will provide excellent finish to the dressed carcass. (Refer to No. 17.)

13 — Merrimack Turkey Breeder Mash:

A breeder mash designed to and will keep breeding toms and hens in the best of nutritional health and condition for the production of high hatching power eggs. Start feeding four to five weeks prior to the saving of eggs for hatching purposes. Available in mash or pellet form.

Miscellaneous Feeds

NIBBLES — see page 26.

14 — Merrimack Hi-Pro-Vite Pellets:

These pellets are intended as a supplement for improved results on lower production birds. Use in conjunction with either mash-scratch or complete system of feeding. Their extra protein and vitamin value should assist.

15 — Merrimack Poultry Fitting Ration:

A soft or mash form offered which is composed of extra appetizing foods plus molasses and full vitamin requirements to assist in appetite stimulation. Do not use as the sole feed for periods in excess of three days. It's proper use is twice daily feeding on top of mash hoppers to the extent of about 2-3 pounds per 100 birds. One large handful per 4 foot length of feeder is ample.

16 — Merrimack Conditioner Pellets:

These serve as a flock treatment for the stimulation of appetite, full nutrition and assistance in the repair of damaged tissues due to certain non-specific enteritis. Its milk product values aid materially in the repair of intestinal irritations.

17 — Merrimack Finishing Ration:

This ration will produce reasonably high efficiency in securing final growth and market finish of the dressed or live carcass. May be used for chickens or turkeys. Use as the sole feed with whole or cracked corn for last two weeks previous to marketing. Available in mash or pellet form.

18 — Merrimack Worm Control Mixture:

A complete ration containing effective amounts of nicotine and phenothiazine to serve as a flock treatment for large round worms and cecal worms in chickens and turkeys. One complete 24 hour feeding treatment is sufficient. Subsequent treatments, one month apart, when infection is noted, is recommended. Available in mash or pellet form.

19 — Merrimycin:

This is a complete, high energy type of feed containing 200 grams per ton of aureomycin hydrochloride. It is useful for quick appetite stimulation during respiratory infections and especially useful as a control

treatment for chronic respiratory disease (air sac infection), blue comb, or during periods of need for an appetite stimulant. Available in mash or nibble form.

20 — Merrimack Hi-Level Sulfa

Mash:

A high energy type of mash to which has been added 0.05 per cent sulfaquinoxaline. Whenever growing birds show infection of coccidiosis

and it is desired to control this infection through feeding, use Hi-Level Sulfa Mash or pellets according to directions given. Useful, also, in reducing mortality from cholera or pullorum disease outbreaks.

NOTE: Merrimack Chick Feed and Intermediate Scratch composed of cracked corn and wheat as well as Merrimack Scratch Feed composed of corn, wheat, barley and oats are always available.

Chicken Barbecue Party

Why not get the neighbors and family together sometime and enjoy a real Chicken Barbecue. Build a stone or block frame and cover fire pit at a height of about 16-18 inches with $\frac{1}{2}$ inch mesh hardware cloth supported with pipe or steel rods. Start fire and

prepare a good bed of live coals below wire frame.

Place split broilers on frame and baste and turn occasionally as they brown and release those delicious odors. With a good bed of coals barbecue time will be about forty-five minutes.

Here is a menu for ten people.

BARBECUE SAUCE:

Mix well
 $\frac{1}{2}$ pint water
 1 pint vinegar
 $\frac{1}{2}$ pound butter
 1 ounce salt

OTHER INGREDIENTS:

1 quart spring salad
 1 $\frac{1}{2}$ quarts scalloped potatoes or chips
 1 $\frac{1}{2}$ pounds sliced tomatoes
 1 pint sweet pickles
 $\frac{1}{2}$ pint stuffed olives
 1 $\frac{1}{2}$ dozen rolls
 $\frac{1}{4}$ pound butter
 2 pies
 1 gallon coffee
 1 pint cream
 1 pound sugar
 1 $\frac{1}{2}$ quarts ice cream
 1 $\frac{1}{2}$ quarts milk
 1 $\frac{1}{2}$ quarts chocolate milk

THE ESSENTIALS:

5 well grown, cleaned and split broilers.

MENU *Newsreel*

Before leaving home

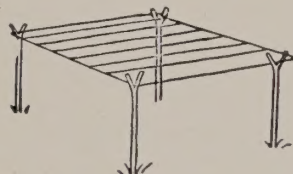
prepare this easy barbecue sauce:

1 onion cut fine,
1 tsp. brown sugar,
2 tsp. dry mustard,
2 tsp. salt,
 $\frac{1}{2}$ tsp. pepper,
 $\frac{1}{4}$ tsp. tabasco,
4 tsp. worcestershire sauce,
2 c. tomato juice, $\frac{3}{4}$ c.

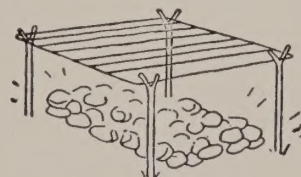
vinegar, $\frac{1}{8}$ pound butter or margarine.
Combine and simmer for ten minutes until slightly thickened. Allow $\frac{1}{2}$ chicken for each person.

In your back yard—in the park—at the shore
have a

QUICK CHICK Barbecue!



Step 1. Prepare fireplace and fire. Set up rack from kitchen range on four bricks, rocks or forked green sticks. Be sure fireplace is steady. Rack should be 8 to 14 inches above ground.



Step 2. Use dry wood or charcoal and let fire die down to a low bed (about two inches) of glowing embers (no flames). Add fuel when necessary.



Step 3. Dip chicken halves in sauce. Place skin side up on rack. Small 2-2½ lbs. ready-to-cook broilers require 50-60 minutes slow cooking. Baste often with sauce to prevent drying out. If birds brown too quickly, spread out coals. Turn occasionally. M-m-m ...you'll love it!



Emily Adams

